Medical Lib.

SEP 13 1922

SERIES 3—Vol. 5, No. 9 SEPTEMBER, 1922

AMERICAN JOURNAL OF OPHTHALMOLOGY

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Annual Subscription Ten Dollars in Advance,
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Published Monthly by The Ophthalmic Publishing Company
7 West Madison Street, Chicago, Illinois.

Entered as Second Class Matter January 1st, 1918, at the Post Office, Chicago, Ill., under the act of March 3rd, 1879.

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AMERICAN JOURNAL OF OPHTHALMOLOGY

Vol. 5 SEPTEMBER, 1922 No. 9

DELIMITING KERATOTOMY.

S. R. GIFFORD, M.D.

OMAHA, NEBRASKA.

The three cases here reported illustrate the practical value of delimiting keratotomy in checking the spread and progress of corneal ulcers. The principles on which the treatment are based are pointed out, and the technic of treating such cases is illustrated.

The object of this paper is to call further attention to a procedure described by H. Gifford in 1918,[1] which has proved of great value in the treatment of certain severe corneal ulcers and which is not, I believe, used as widely as it deserves to be. I have even heard an ophthalmologist condemn in unqualified terms the use of knife or cautery in the treatment of any corneal ulcer.

The following cases are chosen as severe corneal affections which would, I believe, have run a much more severe course, with serious loss of vision, without the use of a delimiting keratotomy.

CASE I. Small Pox Infiltrate of Cornea: Mr. B., aged 51, was referred by Dr. S. M. Shramek of Omaha, complaining of pain and poor vision in R. E. He had recovered from small pox about two weeks before, and his eye symptoms had been growing worse since then. Examination revealed two small infiltrates of the right cornea, one at the inner limbus covered by epithelium and apparently quiet; the other about 2 millimeters from the limbus at eleven o'clock. This stained slightly with fluorescein, and congestion was most marked near it. Vision R. E. 20/100; L. E. V. = 20/50, was apparently normal. The staining area was touched with trichloracetic acid. Atropin, argyrol and hot applications were prescribed. The following three days, in spite of similar treatment, the infiltrate continued to increase in size, while congestion and pain were more severe. The ulceration remained superficial, but the infiltrate was much deeper and extended ahead of the staining area in the manner of a typical small pox infiltrate, in which the loss of epithelium is a secondary and minor affair. Having seen a number of these lesions progress to severe loss of vision unaffected by treatment applied to the surface of the cornea, an early delimiting keratotomy was decided upon. This was done on the fourth day, the cut being made in healthy tissue just ahead of the infiltrated zone and extending beyond it on either side. It was kept open daily for twelve days by touching one edge of the cut gently with the point of a knife and allowing 1/2 to 2/3 of the aqueous to escape. The area was touched with liquified iodin before being opened, and sometimes this application itself could be made to open the wound. The pain was almost entirely relieved after the cut was made, and the infiltrate never progressed beyond the cut. Some congestion remained for about three weeks. After the wound had closed, massage with yellow oxid ointment was prescribed daily and the opacity diminished considerably in size. After six weeks, vision was 20/30; with $-0.25 \bigcirc -1.00$ cyl. ax. 20° = 20/20.

To oculists who have not seen many of these small pox infiltrates, it may seem that this result might have been obtained by less radical methods. In our region, however, we have seen a considerable number in the past three years and their course, in spite of cauterization, the thermophore, and other local and general measures, has invariably been very severe. This is

the only one in my experience which did not suffer severe loss of vision.*

CASE II. Mooren's Ulcer (?): Mr. L——, aged 65, came in complaining of pain in R. E. The trouble had begun about four days before, after he had gotten something, probably a piece of plaster or brick, in the eye. Vision was 20/30. Both eyes showed an unusually broad arcus senilis. In the right eye, near both the inner and outer limbus, the arcus was broadened into a white plaque about 4 millimeters in diameter. At the inner limbus, the surface of the plaque was roughened and stained with fluorescein. There was but moderate congestion and little pain, only the sensation of a foreign body. The staining area was touched thoroly with trichloracetic acid. Atropin and heat were prescribed. The next few days, in spite of local cauterization and this treatment, the stained area progressed. It remained about four millimeters in diameter, healing towards the limbus and progressing slowly towards the center. Smears of corneal scrapings were negative. There was not much more congestion than at first, and only a little more pain, the course resembling a rodent or Mooren's ulcer. On the 6th day, Dr. Harold Gifford applied the actual cautery over the whole affected surface, undermining at the limbus well back into the healthy conjunctiva. In spite of this the central border continued to progress. On the 13th day, I made a delimiting keratotomy just beyond the central border, the patient having been hospitalized. This incision was kept open twice daily for about ten days, with applications of iodin, atropin and instillations of strong and weak zinc. The pain, which had increased, before the keratotomy, now became much less severe, and the ulcer continued to heal from the periphery, never advancing beyond the line of incision. When first refracted, corneal astigmatism was marked (7 D.) but finally vision of 20/30 was recovered with +0.25 cyl. ax. 20°, and the eye was perfectly quiet.

Fig. 1. Result of delimiting keratotomy for Mooren's Ulcer Case II.

CASE III. Serpent Ulcer: George C——, colored, aged 30, was seen at the Douglas County Hospital. Five days before he had been hit in the left

*This subject of small pox infiltrates is more fully discussed in a paper now under preparation by Dr. James M. Patton. It is interesting that C. L. Smith, in a recent article (A. J. O. 1922; 5, p. 32) reports that the only eye saved in three cases was one in which he performed the Saemisch incision.

eye by a stick, since when it had been inflamed and painful. Examination revealed a corneal ulcer about 1 1/2 millimeters in diameter just temporal from the center of the left cornea. After cocainizing, a careful curettage showed that the ulcer extended almost to Descemet's and was undermined at the edges. Trichloracetic acid was applied thoroly on a fine cotton point, and atropin, argyrol and heat prescribed. After three days of such treatment, the ulcer continued to extend slightly in all directions, pain was severe and a slight hypopyon developed. Smears of scrapings showed no organisms. After curetting and applying iodin, a cut was made thru the cornea just medial to the ulcer. This was kept open daily and local treatment continued. Trichloracetic acid, iodin, carbolic acid, and solid optochin were all used for cauterization. In spite of this, the ulcer extended upwards slightly, reaching 4 millimeters in diameter, without, however, crossing the cut. Pain was relieved after opening the chamber each time, but returned some hours after, and for several days, it was opened twice daily. On the 12th day, the chamber was found empty. From this day, pain stopped almost entirely and healing began. When the chamber began to refill three days later, it was allowed to remain so, with no return of pain or congestion. Daily massage with yellow oxid ointment was begun a few days later. When last seen, the eye was quiet with a leucoma about 3 millimeters in diameter, not involving the pupillary space.

The principles underlying keratotomy of any kind in severe ulcers are well understood by users of the Guthrie-Saemisch incision. They are the same as those used by the general surgeon who incises any swollen, inflamed part. The affected cornea is at once relieved of the pressure exerted upon it by the intraocular fluids. The lymph flow, kept at a very low rate by the normal tension upon the cornea, is at once accelerated in the direction of the cut part, bringing in a fresh supply of antibodies, leucocytes and nutrition. It is well known that when an ulcer perforates spontaneously in gonorrheal ophthalmia, if often begins at once to heal, especially if there is a leakage of aqueous for a few days.

While the idea of making the incision a "delimiting" one was apparently used by Alfred Graefe and Meyerhofer, H. Gifford arrived at it independently, and his explanation of its action as distinct from that of any keratotomy, is, so far as I know, original. This explanation he found in the rapidity with which the wound is filled with corneal epithelium. From the fact that most severe ulcers progress by undermining the epithelium, he assumed that it is more resistent than the stroma and that an epithelial plug might act as a barrier to further infection. According to Parsons[2], after a keratotomy, the anterior triangle left by the gaping of the edges is filled with epithelium in 24 hours, including half or sometimes more of the thickness of the cornea. If the wound is kept open for several days it would seem likely that this epithelial plug would extend almost thru the cornea. This factor, of course, if effective, is so in addition to the other factors described as playing a part in any keratotomy.

The cut is made with a thin Graefe knife thru the entire thickness of the cornea, being tangential to the ulcer and as close as possible to its most central edge without touching it. Keeping the wound open once or twice a day is usually sufficient, without making a more permanent opening with the cautery. Case III, however, tho the ulcer never passed the line of incision, did not begin to heal until the chamber remained empty by continuous leakage. Each opening should be made after careful inspection in a good light to be sure that the chamber is not already empty, in which case the lens might easily be injured. The possibility that a cataract might result from prolonged contact between lens and cornea I have not seen realized.

One hesitates to inflict such additional trauma to a cornea unless it is necessary, and a great number of ulcers, of course, do well without it,

It is important in any case, however, to realize quickly when ordinary treatment is proving ineffective and to adopt more radical measures before vision is permanently damaged. I believe there are a great many such cases in which the most valuable radical measure is keratotomy, and there seem to be reasons, brought out strongly by results in my limited experience, why this keratotomy should be made "delimiting."

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HYPERSENSITIVENESS TO LENS PROTEIN. PATIENT DESENSITIZED AND SUCCESSFULLY OPERATED ON FOR IMMATURE CATARACT.

F. H. VERHOEFF, M.D., AND A. N. LEMOINE, M.D.

BOSTON, MASS.

The case here reported furnished a clinical test of the importance of the views presented at the International Congress (see p. 737.) Desensitising injections of lens protein are not recommended for all cases of cataract; but for those proven sensitive and over fifty years of age, who may be operated on with intentional or accidental opening of the lens capsule.

In a paper presented before the recent International Congress of Ophthalmology (see Trans.), we have shown that about eight per cent of individuals are hypersensitive to lens protein; and that when in a hypersensitive individual the lens capsule is opened thru operation or injury, there results an intraocular inflammation which we have termed phacoanaphylactic endophthalmitis. Owing to the danger of rupture of the lens capsule in the intracapsular operation in patients under fifty years of age, we suggested that in a hypersensitive patient under this age, with immature cataract, an attempt be made to desensitize the patient to lens protein, and then to remove the cataract by discission followed by simple linear extraction. In an addendum we stated that we had successfully carried out this procedure in a recent case, and it is the purpose of this communication to relate the details of this case.

CASE: Robert S., Hebrew, aged 46, first consulted Dr. Verhoeff, July 18, 1921. The vision of the right eye had been failing for 2 1/2 years, that of the left eye for 2 years. General health, excellent.

Examination: The lens of each eye shows a diffuse opacity in the posterior cortex, but is elsewhere perfectly clear. Both eyes are otherwise apparently normal. The irides are heavily pigmented. V. O. D. = counting of fingers at three feet, unimproved by lenses.

V. O. S. = 20/100; with +3 S. ⊃ −1 cyl. ax. 60° = 20/30.

General physical examination and urine examination, negative.

Oct. 6, 1921. V. O. S. with correction = 20/50.

Operation upon right eye by Dr. Verhoeff. Intracapsular extraction by capsule forceps, with iridectomy. Scleral suture. The patient proved to be a "bad actor" and squeezed out a considerable amount of vitreous just as the lens was being delivered. After tying the scleral suture, a small pair of scissors was introduced thru one side of the wound and the iris sphincter cut below, to prevent subsequent drawing up of the pupil.

Healing was uneventful, except that on Oct. 29th, the eyelids showed evidence of atropin irritation. The vision utimately obtained was, V. O. D. with +12.25 S. ⊃ +1. cyl. ax. 23° = 20/15.

Nov. 1, 1921. Intradermal test with pig lens protein was strongly positive.

[The lens protein is prepared as follows: One dozen pigs' eyes are ob-

tained from the slaughter house on the same day the animals are killed. Each eye is then sterilized by exposing it a few moments in a Bunsen flame, and by means of a cataract knife first the cornea and then the lens capsule is incised. The lens is then squeezed out of the eye into a sterile mortar. The latter is then covered with a sterile cloth and the lenses allowed to dry, which requires about 48 hours. By means of a pestle they are then ground to a powder which may be kept indefinitely in a sterile bottle. For use, the powder is added to normal salt solution in the proportion of .33 of the former to 10 of the latter. This corresponds to a 10% solution of fresh lens, and from it the various dilutions desired may be made.

As a matter of fact, all of the lens protein does not go into solution, so that the fluid must be well shaken before being used. If desired .5% phenol may be added, but we have found that the solution is so easily contaminated that in spite of this addition it will not keep even in the ice chest. It is therefore highly important to make it up fresh from the lens powder each day it is to be used. In the intradermal test, .04 cc. of the fluid is injected within the layers of the skin.]

Nov. 9. Intradermal tests made in three dilutions: 1:10 = + +, 1:100 = +, 1:1000 = doubtful.

Nov. 15. Desensitizing intramuscular injections of pig lens protein begun. First injection = 0.4 cc. 1:1000 solution.

Nov. 22. 0.8 cc. 1:1000 solution.

Nov. 29. 0.2 cc. 1:100 solution.

Dec. 6. 0.4 cc. 1:100 solution.

Dec. 13. 0.8 cc. 1:100 solution.

Intradermal test, 1:10 = doubtful, 1:100= —.

Dec. 20. 0.2 cc. 1:10 solution.

Dec. 27. 0.4 cc. 1:10 solution.

Intradermal tests, 1:10 —, 1:100 = —.

Jan. 4, 1922. 0.8 cc. 1:10 solution.

Jan. 5, 1922. Operation upon left eye by Dr. Verhoeff. Pupil previously dilated with atropin. Discission of lens with small Ziegler knife, a horizontal linear cut being made in the capsule just below the upper margin of the dilated pupil. Knife introduced subconjunctivally. Patient allowed to go home after a few hours, without a bandage.

Jan. 7. Moderate congestion of eye. Lens swollen and cloudy at site of discission, pushes upper pupillary margin upward.

Jan. 16. Pupil well dilated. Anterior chamber almost obliterated by swollen lens and contains a piece of lens matter below. Upper part of iris pushed up out of sight. Tension normal. No pain. Considerable congestion. Operation on left eye by Dr. Verhoeff. Subconjunctival injection of 4% cocain muriat. Conjunctival flap and scleral suture. Large incision with keratome. Most of the lens matter expressed without difficulty. Irrigation with normal salt solution after tying suture. Lens matter seen enclosed in capsule below, not easily washed out and therefore allowed to remain. No iris prolapse at any time. No iridectomy done.

Jan. 17. Anterior chamber partly reformed. Cornea clear. Transparent lens matter visible in lower half of pupil, enclosed in capsule. No pain. Solution hyoscin hydrobromat 1/3%, once daily.

Intradermal test 1:10 = —. Intramuscular injection 0.8 cc. 1:10 solution lens protein.

Jan. 19. Anterior chamber fully reformed.

Jan. 20. Some pain last night. Bandage omitted. Hyoscin 1/3% three times daily.

Jan. 23. Suture removed.

Jan. 24. Congestion much less. No pain. Pupil well dilated.

Feb. 2. Considerable congestion and photophobia but no pain. Pupil about half dilated. Lens matter becoming opaque.

Feb. 25. Photophobia, lacrimation, and congestion marked. Lens matter absorbing very slowly.

Feb. 26. Intradermal test, 1:10 = +.

Feb. 28. Intramuscular injection 0.2 cc. 1:10.

March 6. Definite improvement in congestion and photophobia. Intramuscular injection 0.4 cc. 1:10.

March 9. Congestion, photophobia and lacrimination much less.

March 13. Improvement continues. Intradermal test 1:10 = —. Intramuscular injection 0.8 cc. 1:10.

March 18. O. S., white and quiet. A thin layer of opaque white lens matter remains enclosed in capsule, obstructing lower inner half of pupil. Fundus clearly seen. Injections discontinued.

May 30, 1922, V.O.S. +12.75 ⊃ + 1 cyl. ax. 170° = 20/15.

REMARKS.

This case proves conclusively that by repeated injections of lens protein it is possible completely to desensitize certain individuals who are markedly hypersensitive to lens protein, so that lens matter left in the eye after cataract extraction will cause no serious reaction. There seems to be no obvious reason why all individuals hypersensitive to lens protein cannot be desensitized in this way, but a large series of cases will be necessary to determine this with certainty.

Following the discission in the present case the eye became considerably congested, but there were no posterior synechiae or other evidences of definite iritis. Following the linear extraction, the eye remained irritable and congested longer that would ordinarily have been expected, but at no time was there descemetitis or posterior synechiae. To ascertain the duration of the immunity, all injections of lens protein were omitted for about six weeks from the day after the operation. At the end of this time, the eye still showed considerable congestion and marked photophobia and lacrimation. An intradermal test was made which proved positive. The weekly injections of lens protein were then renewed, after which the symptoms of irritation quickly subsided. It is evident, therefore, that the injections of lens protein in such cases should be continued after operation until all signs of irritation in the eye have practically disappeared.

Judging by the present case, it would seem that patients under fifty years of age with immature cataracts may now safely be operated upon by preliminary discission of the lens followed by linear extraction without iridectomy. They should first be tested with lens protein, and if found hypersensitive they should be desensitized. As long an interval as possible should be allowed to elapse between the discission and the extraction, but if considerable increase in intraocular tension should ensue, this interval would, of course, need to be made short.

For obvious reasons all patients over fifty years of age with immature cataract should also be tested with lens protein and immunized if found hypersensitive. They may then, no doubt, be operated upon by the capsulotomy method without risk of a poor ultimate result. Operators experienced in the intracapsular operation may, instead, employ the latter method without fear of unfortunate results should the capsule rupture and a large amount of lens matter be left in the eye. Personally, however, we now hope to be able to dispense with the intracapsular operation in the cases of unruly patients, and to restrict its use to especially suitable cases.

In cases of fully mature and hypermature cataracts, and sclerosed lenses, it would seem to be unnecessary, from a practical standpoint, to test the patients for hypersensitiveness to lens protein, since in such cases very little lens matter is left in the eye at operation.

NEUROPATHIC KERATITIS A RESULT OF FOCAL INFECTION.

J. W. CHARLES, M.D., F.A.C.S.

ST. LOUIS, MO.

The views here advanced are that dendritic keratitis and also neuropathic keratitis are caused by lesions of the terminal divisions of the corneal nerves. Illustrations are given showing the form of the nerve terminal branches in the cornea of the dog. A case of neuropathic keratitis is reported, which rapidly cleared up after treatment of subacute ethmoiditis on the side of the affected eye. Read before the St. Louis Ophthalmic Society, March 24, 1922. See p. 736.

In the April, 1904, number of Dr. Alt's AMERICAN JOURNAL OF OPHTHALMOLOGY, I advanced the theory that dendritic keratitis was a terminal nerve lesion; because of the accompanying corneal anesthesia, the shape of the lesion, especially at the beginning, the advancement of the ulcer by new infil-

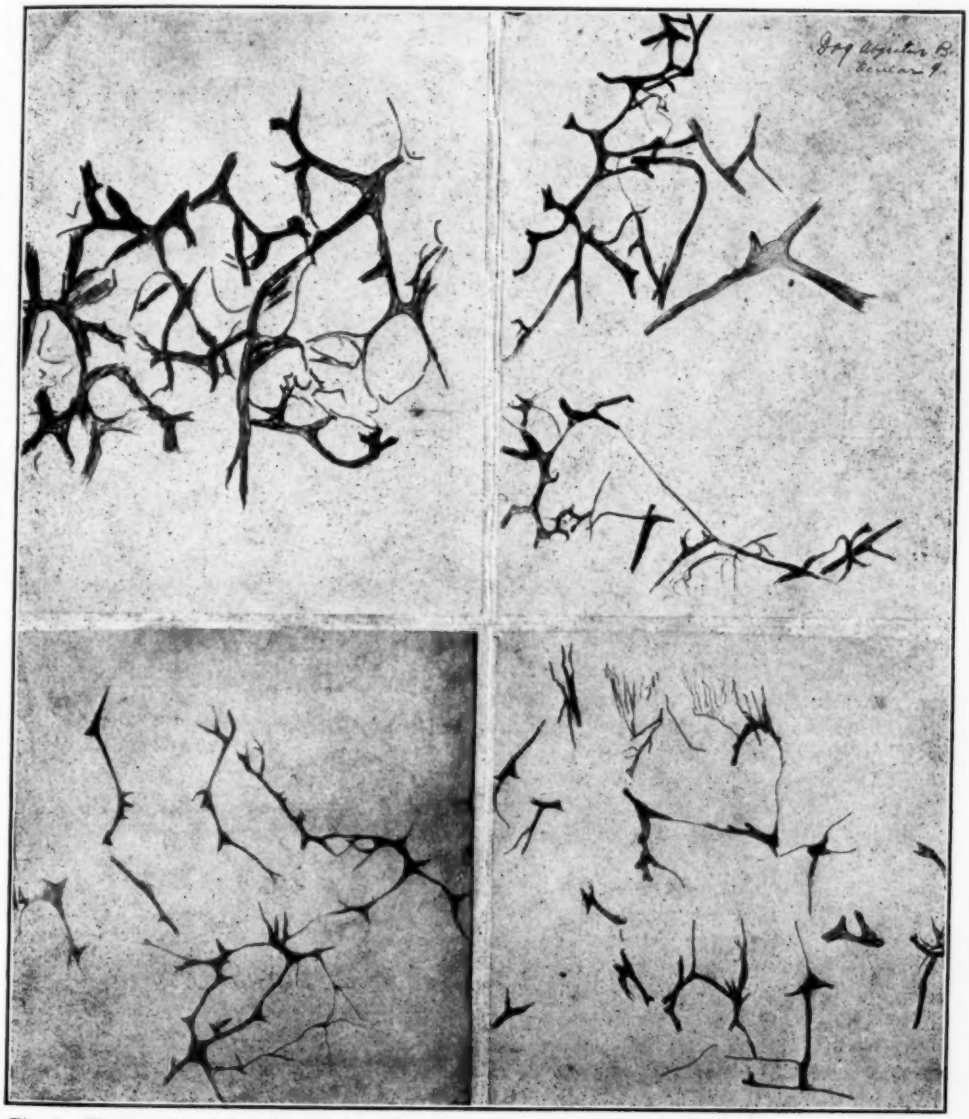

Fig. 1. Photographs of Drawings of the Subepithelial Nerve Plexus in a Dog's Cornea. Made with Zeiss' drawing apparatus. Objective B, ocular 4.

trations as if along the branching of a nerve, and also the extreme chronicity of the disease and the fact that it is seen only during or after those diseases which, when they affect the nervous system, affect the terminal nerves rather than the central nervous system, e. g., malaria, grippe, pneumonia. At that time I reported the case of a man with typical dendritic keratitis who had had grippe; and I contended, that

In order to substantiate the theory that such terminal lesions are possible from focal infections, one needs only to point to the various "neuralgias," without other apparent complication, which have been relieved by suitable treatment of the offending focus.

Dr. W. A. Shoemaker first suggested the idea of such a cause for a neuropathic keratitis, in a case which he accorded me the privilege of seeing sev-

Fig. 2

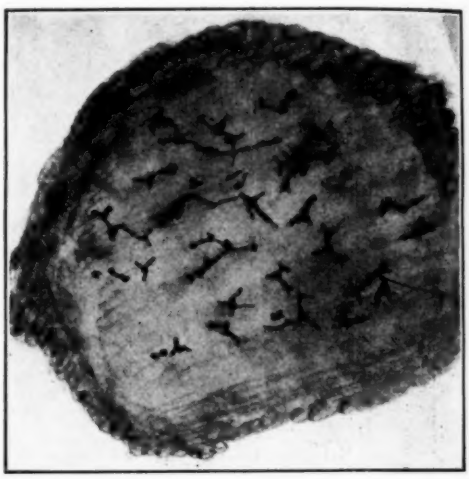

Fig. 3

Fig. 2 and Fig. 3. Demonstrate the Triangular Nodes and Nerve Bundles as Visible to the Unaided Eye. Sections 2 mm. in diameter, magnified 32 diameters. Actual size of A in Fig. 3, 1/7 mm.

while herpes corneæ is vesicular, the typical malarial keratitis is papular and leaves a much more obstinate lesion than results from herpes.

With the Zeiss drawing apparatus for the microscope, I also made drawings of the subepithelial nerve plexus of a dog's cornea, and found that I could reproduce a very convincing combination of appearances of dendritic keratitis by substituting dots and fine lines for the triangular branching nodes and bundles of nerve fibrils, as will be noted in these crude drawings, —not proof but to me somewhat significant. I then proved that if such bundles of fibrils become opaque, or their channels filled with leucocytes, either could be visible to the unaided eye, by comparing them with the finest gossamer, which I was able to quarter mentally under the microscope.

eral months ago, and which he will later describe.

My own patient, a 22 year old girl, of a rather neurotic type, came to me October 12, 1921, with the history that she had had influenza two weeks before, followed by chills and fever five or six times. Dr. J. W. Shaw gave the patient quinine, 3 grains, every three hours for seventy-two hours, and then t.i.d., since which course she has had no chills or fever.

The right eye first began to water and become red six days before I saw her.

Present Condition. There is a small branching ulcer of the cornea, which is accompanied by great photophobia, lacrimation and ciliary injection. On October 21st, the ninth day of treatment, V. R. 23/48 under atropin, em-

metropic. V. L. 23/24, also emmetropic. Treatment consisted in the usual remedies, including iodin and finally mercurochrome, atropin several times a day with holocain, and bandage.

On November 3rd, she was sent to her dentist, who placed her teeth in good order, after having found a right lower third molar badly decayed.

Having exhausted all other methods known to me, on November 16th I referred the patient to a rhinologist, Dr. Roy Scholz, who found a mild suppurative subacute ethmoiditis on the right side, which responded beautifully to palliative treatment. From the time he began to treat the patient daily, by shrinking the sinuses, and by applying mild astringent antiseptics, the eye began to improve,— in fact two days after she was referred the ulcer had healed, altho the ciliary injection lasted some time longer.

Dr. Scholz's letter to me in February states, "When I last saw her I was unable to extract pus from the ethmoids; the mucosa of the entire nose was free from congestion and the patient was entirely free from symptoms."

On December 13th there was only a faint scar remaining, very little photophobia and the vision was: R. 23/24, Em.; L. 23/19, Em.

The patient was last seen December 23rd, and the eye was free from symptoms or signs of disease.

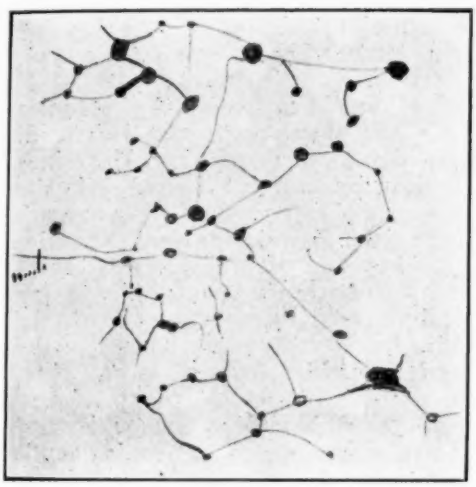

Fig. 4

Fig. 5

Fig. 4 and Fig. 5. Dots drawn exactly width of Triangular Branching Nodes which will be Visible to the unaided eye if opaque and under proper illumination. Average width of Fiber Bundles 11.4 micra. Author's unaided eye quarters a gossamer thread 22 micra in diameter.

PERSISTENCE OF EMBRYONIC FIBROVASCULAR SHEATH OF THE CRYSTALLINE LENS.

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The published cases of this condition are here abstracted and reviewed, and two new cases are reported. Its differential diagnosis is discussed. This is important because eyes presenting this anomaly have been enucleated on the supposition they were affected with glioma of the retina. A bibliography is appended. Read before the Indiana Academy of Ophthalmology and Oto-Laryngology at Indianapolis, January 19, 1922.

This paper was suggested by an unusual condition found in a patient who came for relief from poor vision, by the small number of similar cases reported in the literature, and by the possibility of such cases being mistaken for other conditions, especially glioma, unless a careful diagnosis is made.

The embryonic blood supply of the capsule of the lens, according to accounts of Gradle and of Fuchs, shows the following groups of blood vessels, (1) Those given off from the central artery of the optic nerve, which continues as the hyaloid artery toward the posterior pole of the lens, in Cloquet's canal, halfway thru the vitreous chamber, where it separates into 8 or 10 branches of equal size, which spread peripherally in a meshed formation anastomosing freely with one another, and enter the lenticular sheath midway between the equator and the posterior pole of the lens. Each of these branches subdivides rapidly, making of the lenticular sheath a meshwork of fine arteries, which are interspersed by many capillaries radiating unequally in all directions. (2) The central artery of the optic nerve as it enters the eye gives off lateral branches which form an arterial network in the peripheral portions of the vitreous, and extend forward to the margin of the lens, uniting and anastomosing with branches from the hyaloid artery, forming a specially dense network of vessels surrounding the border of the lens. (3) The anterior branches of the long ciliary arteries, which course thru the mesoderm that covers the surface of the iris, bend over the pupillary edge of the iris and assist in covering the anterior capsule of the lens with a vascular network. The course of these vessels as they pass thru the vascular sheath, over the anterior surface of the lens, is not radial, but assumes a finely woven meshwork anastomosing freely with one another. (4) The veins are derived from the circulation of the iris, and are found slightly posterior to, and directed toward the equator of the lens; and provide for the escape of all the blood into the ciliary region and ultimately into the venae vorticosae.

Two areas of the entire lens surface, the anterior and posterior poles, remain comparatively free from vascularization.

The hyaloid system and the tunica lentis vasculosa reach the height of their development during the sixth month of intrauterine life, while in the sixth and first part of the seventh months, the disappearance of the entire hyaloid system occurs by rapid absorption of the vessels accompanied by an equally rapid disappearance of the tunica lentis vasculosa. Failure of the arteria hyaloidea to be absorbed gives the anomaly known as the persistent stump of the hyaloid artery, while permanent remnants of the tunica lentis vasculosa are known as pupillary membrane.

An endeavor has been made to examine the literature pertaining to all the anomalies found in connection with the embryonic blood supply of the fibrovascular sheath of the lens.

The earliest mention of the vascularity of the lens and its capsule is said to have been published by Howard in 1851. DeWecker observed, in an eye with upward dislocation of the lens, an atrophied artery which extended from the papilla forward and upward, and which terminated in a white substance surrounding the lens. He also described an interesting case of persistent canal of Cloquet, terminating in the shape of an S at the posterior capsule

of the lens; but he did not mention a ramification of blood vessels over the lens.

Fournet in 1879 reported a case of persistent hyaloid artery in a soldier 22 years old with external strabismus, who came into the hospital suffering with pneumonia.

Gardiner in 1880 reported a case of persistent hyaloid canal and artery in the right eye of an American, 22 years old, who consulted him for dimness of vision. Extending from the papilla forward to the posterior capsule of the lens, was a white shining cord of about the caliber of one of the principal branches of the retinal artery. At the insertion into the optic nerve, it formed a funnel shaped expansion entirely covering the papilla and its vessels, and extending beyond at the nasal side. The anterior portion formed a similar smaller funnel, attached to the posterior capsule of the lens;—the cord exhibited rhythmic movements and was found to consist of a bright red blood vessel enveloped in a thin translucent sheath, Cloquet's canal. The expansion at the posterior capsule consisted of numerous little blood vessels spreading and ramifying over the posterior polar region of the capsule. Details of fundus could not be made out very well, and the vitreous was somewhat hazy. There were no traces of similar condition in the left eye. Under atropin, vision right eye 20/200, unimproved by lenses; vision left eye 15/200 improved to 20/40, by plus 12.00 sphere.

Holmes in 1881 reported a case of persistent hyaloid canal in an amblyopic right eye, with strabismus, in a child of 17. Vision 5/100. Under atropin the pupil, which was sluggish, dilated only moderately. A central defect in the field of vision was caused by a white object, shaped like a wine bottle with base on the optic disc, with body, neck and head projecting forward almost to the center of the posterior capsule of the lens. At first it was taken for a cysticercus. No drawings published.

Snell in 1883 reported a case of posterior polar opacity of the lens and persistent hyaloid artery in the left eye, in a child of 11 years, with vision of fingers at 1 foot, and a myopia of 8 D. The opacity in the posterior pole of the lens was made up of fine striae in the posterior capsule. Running backwards from the opacity was a light grey translucent hollow cord, attached at the optic disc to a vessel in the center of the papilla, widening out like a funnel, wavy between attachments. No illustration given.

Collins in 1892 gave a detailed anatomic description of the persistent posterior fibrovascular sheath of the lens in three cases, and subsequently has recognized a like number of cases clinically. Collins is quoted by de Schweinitz in 1899 as saying "persistence of the posterior part of the fetal fibrovascular sheath of the lens may be mistaken for glioma."

Brailey and Ormond in 1899-1900 reported a case of probable congenital vascularity of lens capsule, in the right eye of a child 2 1/2 years old. This abnormality was commented upon at its birth by the attending doctor. The mother noticed it "blood shot." At 1 year the child developed an occasional squint. An opacity was found occupying the inner 2/3 of the anterior part of the lens, while the outer 1/3 was almost clear, with some small scattered opaque spots. On the innermost part of the opaque area were several small vessels with minute branches. The opacity was chalky white and had an uneven surface, the pupil eccentric, the iris, broader at outer than at inner side, dilated only moderately under atropin. No illustration given.

Silcock in 1900 reported a vestigial hyaloid artery starting from a macular coloboma in a child of 16 years who complained of short sight in left eye. From the center of a circular macular choroidal coloboma, a connective tissue thread like branch extended forward thru the vitreous, terminating in a fimbriated extremity, which was attached by a thin strand of connective tissue to the posterior surface of the lens capsule, at the lower and inner part.

Middleton in 1919, out of 28 cases of congenital condition of the fundus or

bulb causing a reduction of vision, observed in the examination of 200,000 soldiers, reported one case of complete pupillary membrane, with slight dimness of vision in the right eye, altho vision was stated to be 20/20. The iris was free from adhesions, but there was a thin, congenital, film like membrane nearly transparent, covering the entire right pupil and attached to the iris equally around the whole of the pupil. Examination with a loupe showed a vertical slit 2 mm. wide at center, extending across the pupil, resembling the slit like pupil of a cat's eye, and gradually coming together at each end near the margin of the pupil. Atropin dilated the pupil slightly horizontally but not vertically, while the opening in the pupillary membrane was widened to twice its original width. The distant vision was reduced under atropin to 20/200. The left pupil was free from membrane or pupillary bands. Vision in left eye 20/30.

Lane in 1919 reported two clinical cases, and three eyeballs examined microscopically, with persistent posterior fibrovascular sheath of the lens.

Of the clinical cases, one a child of 14 years, had convergent upward squint since one year of age, with vision in right eye 3/200. Right lens in anterior nasal third of cortex was irregularly opaque at different levels. Opacity continued to the mesial side and involved larger area of posterior cortex. A chalk like opacity was nasally displaced on the vitreous surface of posterior capsule. A long narrow vertical slit thru this opacity showed a red reflex, and from the opacity 5 or 6 narrow, spindle, grayish white striae ran forward and obliquely downward in the nasal direction. A reddish hyaloid artery extended from disc to lens.

The second child, 6 years old, had poor vision and white pupil in the right eye. Vision was limited to shadows, no red reflex. The pupillary and ciliary zones of iris were not definitely demarcated, and a network of delicate pupillary membrane threads stretched across the lower third of right pupil. Under atropin pupil dilated irregularly below, where three short narrow triangular shaped tags of iris appeared to be pulled toward the center by pupillary threads. Completely surrounding the posterior surface of the lens was a glistening uniformly white opacity, on the anterior surface of which was a single tortuous vessel running across the horizontal meridian. Four or five finer vessels taking a horizontal course were below, toward the temporal side. Left eye, vision limited to fingers at 18 inches. Left pupil dilates regularly. An opacity lay back of the upper nasal quadrant and spread out behind the upper one-fourth posterior surface, as a fixed cobweb like network. No fundus details were made out. Refractive error was about plus 6.

The three eyes examined microscopically by Lane were enucleated for suspected glioma. One, a baby of 1 1/2 years with a gray spot behind the left pupil seen by his parents, showed a vascularized white tissue behind the lens, which proved, after the eye was removed, to be a persistent posterior fibrovascular sheath of the lens with patent hyaloid artery attached. In the second baby, when 2 months old, was noticed a discolored pupil in the right eye. At 3 months there was a shallow anterior chamber and a reddish gray reflex, behind the lens. Microscopic examination showed a persistence of pupillary membrane, a persistent fibrovascular sheath of the lens, with a gap in the posterior capsule, hemorrhage in lens and a hyaloid artery. In the third baby, 3 months old, the left lens was seen to be pushed forward on the nasal side, and a gray vascular tissue was situated in the most anterior region of the vitreous. In the removed eye was found a persistent posterior fibrovascular sheath of the lens, with hyaloid artery and a partial irregular development of lens.

More recently several cases were presented before different societies, but illustrations were not published and letters from most of the authors showed none had been made. Schwenk's case was that of a Russian girl, 15 years old, who had poor vision, pain in both eyes after reading and excessive lacrimation. Under a mydri-

atic pupils were irregular. Right eye: Three distinct brown bands were attached to the smaller circle of iris and, crossing the pupil to the opposite side, were adherent to the lens capsule in the pupillary area, appearing like a brown membrane on the lens, almost covering the pupillary area. Vision 20/200, improved to 20/70 by minus 2.50 sphere. Left eye: Four bands crossing from side to side nearly at right angles gave a brownish membrane appearance on lens capsule. Vision 20/70, improved to 20/50 by minus 3.00 sphere.

Shields' patient was a man, 28 years old, born in Russia. Two weeks previous to consultation, he discovered that vision in left eye was practically gone. On the anterior capsule of both lenses was a deposit of minute pigmentary areas, more dense in left than in right eye. In left eye was a fragment of brownish tissue at the margin, which appeared to be a tag of pupillary membrane. Vision left eye, fingers at two feet.

Crisp reported a case of persistent remains of the embryonic system of blood vessels, between the optic disc and the lens in the right eye of a woman of 29 years. Vision, right eye with correction of plus 3.00 S. is 5/10 plus; left eye with plus 1.25 S. is 5/3. The remains appeared as a black strand, wavy and fairly mobile, extending completely from disc to posterior pole of lens.

Suker presented a young man with a persistent hyaloid artery and a fusiform aneurysm of the superior temporal retinal artery in one eye. There were three distinct motile branches, 3-5 mm. in length, on the temporal side of the disc, attached to the main trunk of the remains of the hyaloid artery, which was fixed and 5 mm. long. On the superior temporal retinal artery were seen several fusiform dilatations about 5 mm. long. Vision, normal.

In recently abstracted literature, three additional cases are cited. Takao saw a patient with pupillary membranes in both eyes. The membrane was on a plane with the anterior surface of the iris, with an opening in the middle in front of the true pupil.

Axenfeld reported a case of movable pupillary membrane in a young man having diminished vision in a bright light. Pupils were slightly irregular, with a greyish color in the pupillary areas, which disappeared on looking up. Lateral illumination showed a pupillary membrane thrown into folds when contracted, which became smooth and transparent on dilatation of pupil. The membrane was attached to the posterior surface of iris.

Perry had a case with normal vision, in which a remnant of the hyaloid artery was attached to posterior capsule of the lens and ended in the vitreous.

Rumbaur in 1921 described star shaped remnants of the pupillary membrane in the anterior lens capsule. These could be seen under magnification of 60 or 70 with strong illumination. According to Rumbaur, the star shaped formations occur in 35% to 40% of all individuals, of which 2/3 show the anomaly in both eyes, and in persons of all ages, 5 years to 72 years, decreasing in frequency with increasing age. They occur with other anomalies found at birth and often with other remnants of pupillary membrane, with which they seldom stand in direct relation. Defective vision on account of them seldom occurs, because of their peripheral location. He also gives references to several articles in German literature dealing with pupillary membrane. These have not been seen.

REPORT OF CASES.

CASE 1. Mary H., aged 7, referred May 5, 1921, by school nurse, because of inability to see blackboard.

Vision in each eye 20/100, not improved by lenses. Retinoscopic examination under homatropin cycloplegia, alone or with minus or plus lenses, failed to show movement of shadow across the pupil, altho the red reflex was quite distinct. The trial case test gave no improvement in vision. The ophthalmoscope revealed the following picture. Fundus in either eye seen with difficulty, but apparently normal.

On examination of the right eye, with plus 20 behind the aperture, a

fine meshwork of thread like lines appeared to cover the central part of the lens, with an occasional small nest like terminal dot surrounded by meshwork. In the left eye, with a plus 20 behind the aperture, a similar meshwork was seen, but with larger and more prominent, dark, nest like spots and larger portions of the lens clear. No remnants of hyaloid artery could be seen in either eye. A 1/2% atropin solution was instilled three times a day for four successive days, at home, and again an effort was made to improve vision from the trial case, but without success.

The complete dilatation of the pupils showed additional thread like meshwork around the periphery of the lens in either eye, which had not been seen before. In either eye the central meshwork seemed to branch from a main stem, which was thickest at the lower edge of the lens. In and surrounded by the meshwork, were the small round nest like spots, more prominent in the left eye. The fine meshwork around the periphery of the lenses seemed to have no connection with the larger central masses, and did not reach more than one-fourth distance across the lens. Drawings were made with the child in the recumbent position, looking up at the ceiling or fixing a finger held two feet directly above one eye. Nothing of importance in the family history could be obtained. The patient is the oldest of three children and the only one unable to see well. The mother and one younger child were examined and had apparently normal eyes. The father and other child could not be obtained for examination.

CASE 2. Mrs. C. brought her small daughter because of impaired vision. History: The mother, had an undeveloped right eye, a defect which she feared might have been transmitted to her child. Examination of this eye under 4% cocain mydriasis showed a marked opaque fibrovascular sheath, with minute blood vessels radiating from it. She stated this was noticed at birth. During infancy and childhood, the eye was carefully watched for inflammatory symptoms and blindness. She has peripheral vision of large objects. She could not be persuaded to sit for a drawing of the anomaly.

Fig. 1. Appearance of blood vessels in fibrovascular sheath of lens of right eye of case 1 described in text.

Fig. 2. Appearance of blood vessels in fibrovascular sheath of lens of left eye of case 1 described in text.

DIFFERENTIAL DIAGNOSIS.

Brief differential diagnosis between glioma of the retina and persistent fibrovascular sheath, and between cysticercus of the vitreous and either persistent hyaloid artery or persistent fibrovascular sheath, may not be out of place.

Glioma of the retina occurs most frequently in children, usually under five years, most often involving one eye, altho bilateral cases have been reported. There is noticed first, a bright, whitish or golden yellow reflex from the pupil and a lack of vision. Under focal illumination a light colored nodular mass behind the lens covered with

minute vessels is seen. At first there are no inflammatory symptoms, only the light colored reflex and the blinding of the eye. It is at this stage that a persistent fibrovascular sheath may easily be mistaken for it.

As gliomas grow rapidly and persistent fibrovascular sheaths remain stationary, careful measurements will determine the diagnosis. Glioma, if seen early, when it is small, is visible thru the naked aperture of the ophthalmoscope, while a fibrovascular sheath requires a plus 16 to plus 20 lens to bring out the remnants of the minute blood vessels connected with it. These two points alone would serve to differentiate between glioma and persistent fibrovascular sheath.

Hyaloid artery with a funnel shaped extremity with its rythmic movements may be mistaken for *cysticercus* in the vitreous, as in Holmes' case. The parasite appears as a bluish white, bottle shaped bladder, if head and neck are extended, or as a brilliant white spot, if head and neck are withdrawn. The head in early cases moves actively. If this is extended, there may be seen one of the four suctorial discs and a crown of from 2 to 20 hooklets. If of long duration, opacities of the vitreous form around it, and it appears as a dense white mass. At this time it may be mistaken for a persistent fibrovascular sheath. In cysticercus infestation vision is finally lost, but in persistent fibrovascular sheath vision, altho reduced, remains unchanged. The diagnosis of a cysticercus from a persistent hyaloid artery can be made by the hooklets on a moving head; while the persistent fibrovascular sheath may be diagnosed by the strength of the lens necessary to see the latter, the amount of vision remaining and absence of inflammatory symptoms.

In closing we would suggest a systematic reporting of all similar cases, with drawings if possible, that a knowledge of their prevalence may be obtained; that a more careful differential diagnosis be made to eliminate the tragedy of enucleation in questionable glioma and cysticercus, and a more detailed study of lens capsule in both diseased and normal conditions along lines suggested by Rumbaur.

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REMARKS ON REFRACTION.

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The importance of exact correction of errors of refraction is here pointed out. The necessity of recognizing different types among these patients is mentioned. The value of cycloplegics and their absolute necessity in measuring the refraction of some cases are dwelt upon.

That the human eye unaided cannot stand up under the demands of modern life is evidenced by the increasing numbers of persons who are wearing glasses; and by the tremendous increase in the optical stores to supply such a demand.

Refraction of the eyes, careful and thoro refraction, is, in many cases, a difficult and complicated affair; and one often wonders why people consider their eyes so lightly that they will permit an inferior sort of treatment that they would never dream of having accorded to any of their other members.

Perhaps, in a way, oculists have been to blame to the extent that they have not as a class given the work the care and attention that it really needs; so that the laity, and perhaps the medical profession generally, have come to consider the correction of errors of refraction as quite a minor affair, one that can just as easily be attended to by the advertising optician on the street as the trained oculist in his office.

Probably the truth is that there is room and need for both the fitting optician and the measuring oculist. There are a great many people who have so great an amount of eyestrain, that almost any correction at first will bring some relief. And these people might just as well have an optician fit them at first; because in the life of most people who are compelled to wear glasses, there will come a time when such help will prove unavailing, and then some one must be found who knows how to do a thoro refraction, and will be interested enough to take the time and care to do it. But the objection is that usually these people who have purchased glasses and not service often underrate the value of the services of a competent refractionist; so that of itself alone, refraction is not a good economic business, unless it can be supplemented by the better paying specialist work. People are often willing to pay more in the aggregate for having inflamed eyelids treated than they would pay in a lump sum to an oculist who would do a first rate refraction, correcting the underlying eyestrain, and at the same time curing the symptom, the inflamed lids.

Patients who go to an oculist who practically devotes himself to refraction, must find something more than a refractionist. The oculist must be in addition a well trained physician; because if any one expects to be first rate he will certainly have to see a great deal more than the retinoscope reveals to him. The ciliary muscles are often as contrary as some human beings; and a study of the part necessarily means a study of the whole.

They told me in college that the optic nerves are really prolongations of the brain itself; and that probably accounts for the many psychic and nervous phenomena that may be observed in many eyestrain patients by a trained physician. This means, of course, that one must not lose sight of the patient himself when one attempts to adjust his defective refractive system.

It is also a matter of comment in many cases of considerable refractive error, in patients of good physique and well balanced nervous systems, how little complaint is made, the trouble usually being stated as difficulty in reading the badly printed numbers in the telephone directory or in reading the newspapers. There are here no complaints of headaches, pains around the eyes, etc. And yet in people of the nervous type, without the same robust physical health, the smallest amount of eyestrain, even a quarter of a diopter of astigmatism, will produce

symptoms that are pronounced and very annoying. Which goes to show that the type of patient must be considered in any examination of the eye.

To illustrate: Mr. H., age 53, complains of difficulty in reading his paper; this has bothered him only for the last couple of months, but he finds he can read fairly well in a good light. He has never worn glasses, nor ever had any sort of discomfort with his eyes. Examination revealed that even the largest Jaeger type was blurred; and he really needed a telescope to read the newspaper at the distance he had to hold it from his eyes in an endeavor to see the type.

Under drops the correction was:

R. W. +1.00 ⌒ +0.25 cy. ax. H. =16/13.

L. W. +1.25 ⌒ +0.25 cy. ax. V. =16/13.

With correction for near:

R. W. +2.00 ⌒ +0.25 cy. ax. H. =p.p. 10 1/2-11″.

L. W. +2.25 ⌒ +0.25 cy. ax. V. =p.p. 10 1/2-11″.

About +1.25 less than most men at his age require for this range. To show the opposite type:

Miss S., age 18, student, complains of headache, blurring vision, and of being nervous. V.R.=16/13; L.=16/20 minus.

Under drops the correction was R. and L. +0.25 cy. ax. H.=16/13 and p.p. 3-3 1/2″.

With this correction all the symptoms subsided, and she has continued her studies with perfect relief from any discomfort.

THE QUESTION OF MYDRIATICS.

If all the oculists had the same mental make-up, there would then probably be only one opinion on the subject of mydriatics in refraction. But with different mental attitudes and different experiences, there cannot be any unanimity of opinion. Therefore, each oculist must settle the question for himself. I was trained to the use of a mydriatic in refraction, and a long and varied experience has not changed my method, but rather extended its use. The impression prevails that a mydriatic is usually not required after forty years of age. But it astonished me what poor results I obtained until I began to use homatropin in the eyes of people beyond middle life, even up to the age of sixty.

The idea that the muscles of accommodation of children and young adults are difficult to relax, and that beyond forty years of age they are easily paralyzed by a mydriatic, I have had to revise in the light of my experience, until I have come to believe that age has nothing to do with it. It is the type of person, the character of the refractive error, and the sort of work to which the brain and the eyes are subjected that count. One will find spasms of the muscles, under the influence of homatropin, when fitting glasses, just as readily in a person of fifty as in a child of five. And recently in a woman of fifty-eight I noticed the same thing—that homatropin does not paralyze completely the muscles and iron out the spasm of the muscles at the first treatment with it.

It is my belief that no eye can be completely and finally fitted with glasses at the first and only sitting. In young children, who have not yet had the time and the use of their eyes to develop hypertrophied muscles, homatropin or atropin relaxes them sufficiently to enable one to do a first-rate refraction. But as the eyes develop with the body, there will be changes as time goes on that will necessitate a change in the glasses. In adults, young and old, who have never worn glasses, or have worn improperly fitting ones, it has been my experience, that after the first correction it is usually necessary a few years later (sometimes much sooner) to repeat the examination. And even this may have to be repeated after a further lapse of time, to finally gather up all of the slack that the hypertrophied ciliary muscles have grudgingly let go, until the lenses practically do all of the work and place the eyes almost in a state of rest when looking off into distance. Let me illustrate:

Mrs. G., age 27, complains of headaches, blurred vision. Was fitted by an optician, who changed the lenses

three times in the month. V.R. and L.=16/25, August, 1910.

Under drops the correction was:

R. +0.50 ⌒ +0.50 cy. ax. 75°=16/13

L. +1.00 ⌒ +0.50 cy. ax. 75°=16/13

I deducted + 0.50 sphere from the above, which gave her excellent vision and relieved her symptoms. It was noted on my record that the muscles were not thoroly relaxed by the homatropin. This patient returned about three years later, and told me that she had been perfectly free from any symptoms until within the last three months, when the headaches began again.

Under drops the correction was:

R. +1.00 ⌒ +0.50 cy. ax. 75°=16/13.

L. +1.00 ⌒ +0.50 cy. ax. 75°=16/13

A deduction of +0.25 sphere was made and the correction given. On this occasion, too, there was some spasm of the ciliary muscles.

Four years after this, she again returned with the same report—headaches commencing again.

Under drops the correction was:

R. +1.25 ⌒ +0.75 cy. ax. 75°=16/13.

L. +1.25 ⌒ +1.00 cy. ax. 75°=16/13.

Deduction of +0.25 sphere was made from the above. Two years later the patient reported that she had had no further trouble. At this last examination the muscles were thoroly relaxed by the homatropin. Seven drops of a two per cent solution of homatropin were used, at intervals of ten minutes, in each eye for the three refractions; and the method and the care used were the same on the three occasions.

From this experience I set up the hypothesis that the eye muscles are like the skeletal muscles in the beginning of life, soft and easily tired, until time and exercise bring increasing strength and resistance to fatigue. Just as the athlete has greater strength and endurance from the hypertrophied muscles developed by his training and the greater use of his muscles, so the child who has considerable refractive errors to overcome must work his eye muscles in the same manner that the athlete exercise his skeletal muscles; and consequently gets the same results —hypertrophied muscles that have great strength and endurance, and consequently are not easily relaxed.

As the strength and endurance of these muscles begin to wane, there will come symptoms of tiring with the accustomed work, and it then becomes necessary to take up the extra work, that the eyes can no longer do without tiring, by putting on lenses. As the muscles get accustomed to doing less work than formerly the glasses will become indispensable, and the patient will tell you that he can no longer use his eyes without the glasses. When this takes place, it will not be a great while before it will become necessary again to relax the muscles and take up the residual work that the muscles are doing, to get normal distance vision. When this result is obtained, then, and not until then, is the eye placed in a condition to see in the distance without using the accommodation, the ideal aimed at by the oculist.

Following out this line of thought, it would show that exhaustion would overcome the weak and the ailing first, and in the strong might be put off to a period well into middle life, or even beyond. And such is the case. In childhood after a debilitating sickness, it is noticed for the first time that the child has eyestrain, and examination will reveal considerable refractive errors, that had been present all of the time, but became apparent only when the weakened condition of the child made it impossible for it to waste the energy that it had formerly done, by reason of its improperly adjusted refractive media. Adults, of good physique, or by reason of the fact that they do not use their eyes for any exacting work, often go well into middle life, until the increasing presbyopia added to the static refractive errors begin to draw the patient's attention to his eyes, and he realizes, perhaps when he is about fifty years of age, that he will have to wear glasses if he wishes to read his paper in comfort. Such people as these often boast to one that neither of the parents ever wore glasses, and that they had excellent distance and near vision all of their lives.

To illustrate the uselessness of fitting glasses on some patients without the use of a mydriatic, the following example will show: This patient was fitted by an oculist who had assured me that he never could see any reason for relaxing the muscles, and that neither he nor his patients had any reason to complain about his method.

Mr. W., age 31. Complained of headaches every afternoon; went home exhausted after his day's work. He was wearing:

R. +1.50 ⌒ +0.25 cy. ax. V.
L. +3.50 ⌒ +0.50 cy. ax. 75°.

Under drops the correction was:

R. +4.25 ⌒ +0.50 cy. ax. 75°.
L. +5.25 ⌒ +0.75 cy. ax. 105°.

A deduction of +1.00 sphere from the above gave him excellent distance and near vision; and his symptoms disappeared.

To illustrate the necessity of using a mydriatic at middle life and beyond:

Dr. B., age 56. Wearing:

R. +1.75 S.
L. +0.87 ⌒ +0.62 cy. ax. 145°.

Tho fitted by a number of oculists, had never had his eye muscles relaxed. Complains that his eyes bother him so much that he cannot attend to his work.

Under drops the correction was:

R. +2.00 ⌒ +0.25 cy. ax. 15°.
L. +1.00 ⌒ +1.50 cy. ax. 165°.

A deduction of +0.25 sphere from the above for distance, and a suitable addition for near gave him instant relief.

Dr. Y., age 54. Wearing:

R. +1.25 ⌒ +0.25 cy. ax. 90°.
L. +1.75 ⌒ +0.25 cy. ax. 180°.

States that he has never had his eye muscles relaxed. Is so exhausted after a day's work that it takes the joy out of living.

Under drops the corrections was:

R. +1.50 ⌒ +0.75 cy. ax. 30°.
L. +2.00 ⌒ +0.75 cy. ax. 165°.

This physician reported to me the other day that he had never realized before what comfort and joy properly fitted glasses could give to one.

Mrs. P., age 58. Reports that she has always had strong eyes, that she used them without any thought or care. Has been wearing a pair of glasses for near work, which she picked up in some cheap store. For the last two months, the right eye has watered a great deal, and has bothered her so much for the past week that she could not read. The manifest in the right eye was: R. +0.75 ⌒ +0.50 cy. ax. 145°=16/40. But there was so much spasm of both eye muscles that it seemed a waste of time to bother this way.

Under drops the correction was:

R. —0.25 ⌒ +2.25 cy. ax. 75°= 16/13.
L. +1.00 ⌒ +0.50 cy. ax. 105°= 16/13.

The lenses given to her gave her perfect distance and near vision.

It is my belief, then, that refraction does not receive the attention that it really needs. That while there are a great many people, particularly in childhood and youth, who will find comfort in almost any refraction; yet the fact remains that a day will come when even these will have to seek some one who will refract them properly. That to refract properly, it is necessary in every case where there is spasm of the muscles to use a mydriatic *without any consideration for age.* That it is people around middle age and beyond who have the most trouble from refractive errors; and in order to overcome their discomforts they require the utmost care and attention, which, without the use of a mydriatic, will often prove futile and unavailing.

PRACTICAL SUGGESTIONS ON REFRACTION.

S. A. AGATSTON, M.D.

NEW YORK, N. Y.

This paper details the method of taking the history and examining patients who come for relief from errors of refraction. It includes points to be particularly inquired into and methods of testing for the refractive error.

The work of the refractionist does not by any means consist of the mechanical examination of the eye with prescription of glasses. If properly done, it must take into consideration the numerous complexities which enter into the causation of ocular symptoms, whether local or general. All cases with ocular symptoms are not for the oculist; all ocular cases are not necessarily for prescription of glasses. Thus every case is a problem which must be solved, before any attempt to prescribe is made.

In taking the history, the following questions must be carefully gone into: Age, ocular symptoms, general health, amount of ocular work, conditions under which the work is done, the patient's habits, vision, condition of the ocular muscles (external and internal). A careful search for any pathologic changes should be made.

AGE. *Hypermetropia.* A healthy young individual may easily overcome a slight error without any eyestrain. Even a greater error may be overcome with or without symptoms. A very great error is generally accompanied only by poor vision (as no attempt constantly to correct is made). In the older patient, a slight or moderate error is corrected with symptoms of eyestrain. A greater error results only in poor vision, on account of the loss of power of accommodation. Presbyopes will get eyestrain, if they try to read without glasses, particularly in the early stage of their presbyopia, or when wearing too strong a correction.

Myopia. Myopes do not generally suffer from eyestrain, unless they have marked astigmatism, or when wearing an overcorrection. Myopia decreases with age. This is due to sclerosis, or flattening of the lens. High grade myopia may be progressive.

OCULAR SYMPTOMS. These consist of burning, itching, tearing, conjunctivitis, blepharitis, supraorbital pain, fronto-occipital pain, temporal headache, rarely unilateral headache, gastric symptoms, vertigo, blurring of vision after prolonged reading, etc. Other causes for headache must be carefully considered. These may be: supraorbital neuralgia, sinuitis, gastrointestinal disturbance, anemia, cardiac disease, arteriosclerosis, uterine disease, alcohol, tobacco, bad atmospheric condition, etc. Headache caused by the eyes generally comes after use for near work, cinema, theater, shopping, etc. The headache is more frequent in the afternoon or evening. Rarely, the headache may not come till the next morning. Sometimes, in the presence of a marked error of refraction, the headache may be constant.

GENERAL HEALTH plays an important rôle in refractive errors. A patient may never feel any eyestrain until his general condition is below par. Glasses will relieve his eyestrain, but are frequently discarded when his health improves. Hypermetropes in good health require less correction than those in poor health.

AMOUNT OF OCULAR WORK. A good deal of near work, such as reading, writing, sewing, embroidering, will cause eyestrain even in the presence of a small hypermetropic error. In distant vision, driving an automobile, watching motion pictures, etc., will often be followed by eyestrain.

CONDITIONS UNDER WHICH THE EYES ARE USED will contribute toward the etiology of eyestrain. Thus: poor light, artificial light, light coming from the wrong direction, glaring light, habit of holding the work too close to the eyes, reading of very small print.

VISION. Good vision means emmetropia, hypermetropia of slight or moderate degree, slight myopia, or moderate astigmatism. Poor vision means myopia, marked hypermetropia, or

marked astigmatism. In older patients even a moderate hypermetropia may cause poor vision.

CONDITION OF OCULAR MUSCLES. This takes in principally exophoria, insufficient power of convergence, insufficient power of accommodation (asthenopia). In myopia exophoria is practically always present, but in spite of that, there is good power of convergence. When exophoria is present in the hyperope, convergence is generally insufficient. Such a condition may cause eyestrain and headache, which glasses will not correct, unless the exophoria is corrected by prisms or preferably by convergence or prism exercises. Hyperphoria will often cause headache, in spite of proper correction, unless a prism is used.

PATHOLOGIC CHANGES may account for poor vision and should, therefore, be carefully searched for. The most important of these are: opacities of the cornea and Descemet's membrane, changes in pupillary reactions, presence in the pupillary area of exudate on the anterior capsule of the lens, lenticular cataract, opacities in the vitreous, diseases of the choroid and retina, particularly in the region of the macula, diseases of the optic nerve. In the absence of evident pathologic changes, we must not forget toxic amblyopia, incipient glaucoma, congenital amblyopia and amblyopia ex anopsia.

MANIFEST REFRACTION. Examination of this is generally satisfactory in patients 40 years of age, or over. In younger patients, if starting with poor vision, we are able to get perfect vision with correction, it may not be necessary to go any further, prescribing the result of our manifest examination.

In *myopia* prescribe the weakest sphere that will give 20/20 vision with both eyes. In the presence of slight symptoms of eyestrain, with good vision, an *astigmatism* correction, especially when against the rule, may prove satisfactory. When no astigmatism is present, only apparent *hypermetropia,* retinoscopy should be resorted to; as also in all cases with marked symptoms of eyestrain, and when the manifest examination fails to give a satisfactory result. Children with poor vision or ocular symptoms should be retinoscoped after atropin has been used for three days.

The ophthalmometer is a useful guide in cases of astigmatism. It will indicate with fair accuracy the axis of the cylinder. 0.75 seems to be the normal ophthalmometer finding for a normal cornea. 1.00 should indicate 0.25 with the rule; less than 0.75 would indicate astigmatism against the rule. It is a safe rule not to give a larger cylinder than the ophthalmometer indicates. Occasionally with a normal ophthalmometer reading (0.75) retinoscopy will show a slight lenticular astigmatism (0.25 to 0.50). Sometimes a high corneal astigmatism is counterbalanced by lenticular astigmatism and practically no astigmatism is indicated by the manifest examination or retinoscopy.

RETINOSCOPY. The degree of hypermetropic correction depends on the intensity of the symptoms and the age of the patient. The older patient requires more correction. The correction may vary from 0 to full correction. When in doubt make a postretinoscopic examination, particularly for near vision. Young hyperopes have strong power of accommodation, some of which they should be allowed to retain. The amount of correction should be in proportion to the degree of eyestrain and the amount of near work.

Full correction is given in the presence of convergent squint and when vision is poor owing to the loss of power of accommodation. The younger and healthier the patient, the less correction is required. Once a full correction is given, the patient becomes too dependent on his glasses. Patients with exophoria and weak convergence, if hypermetropic, should be given a weak correction until the exophoria is corrected by exercises, etc.

Presbyopes with exophoria should not be given a strong correction, and should be satisfied with a near point of 16 to 18 inches. Exophoria in presbyopes who have not used any glasses,

or who have worn very weak correction, results from nonuse of convergence. Too much correction in the beginning will cause distress. In mixed astigmatism, correct vision first with cylinder; then, if a minus cylinder was used, treat the case like a hypermetropia; if a plus cylinder was used treat the case like a myopia. We choose the cylinder which will leave the weakest sphere to be used. Sometimes the sphere may be dispensed with.

TRIAL FRAMES FOR BASE LINE REFRACTION.

SIDNEY L. OLSHO, M.D.

PHILADELPHIA, PA.

The frames here described are designed to make effective the coordination of refraction with spectacle eyeglass fitting.

The logic of refracting with perfect trial lenses held in a definite position, which predetermines the position of the finished spectacle or eyeglass lenses, should appeal to every refractionist. The futility of making fine differentiations in focus or axis under any other conditions is self evident.

I submit illustrations and a description of the mechanically perfected model of the trial frame described by me, in the AMERICAN JOURNAL OF OPHTHALMOLOGY, July, 1920, Vol. 3, No. 7.

This trial frame is not the end but the means by which refraction is definitely coordinated with spectacle and eyeglass fitting. I wish to reiterate certain principles of this coordination so that the underlying purposes of the frame may be grasped, and so that this system may be universally understood and adopted.

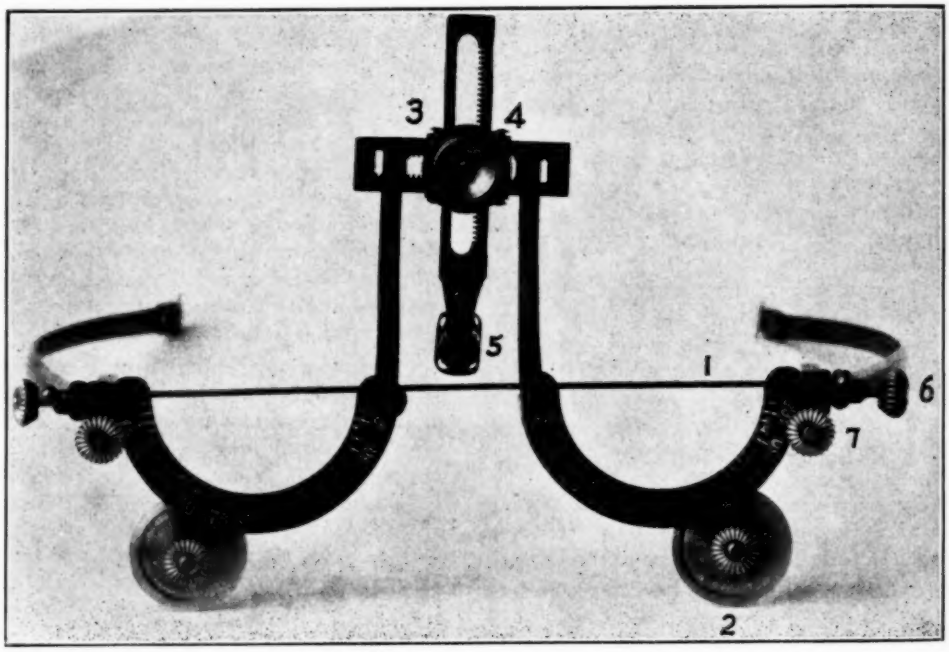

Fig. 1. (1) The 180 degree markings appear on both temporal and nasal sides for each eye, all four on one continuous line, as shown by the long horizontal rod resting on four supporting pins. (2) Grooved friction wheel to rotate trial cylinders. (3) Wheel for centering trial cells. (4) Wheel for raising or lowering perforated, conforming nose rest. (5) Set screw for positioning nose rest forward or back. (6) Knob, one for each temple, controlling its spread, securing even tension on both sides of the head and equal distance of both cells from the eyes. (7) Knob for delicate control of the new, separately adjustable tilting temples. Tilt one temple only and the corresponding end of the trial frame is raised. Tilt both equally and the trial frame is tilted forward from the top to the desired angle. .

I. The trial frame front is rigid.

II. A horizontal test rod, resting on four supporting pins is used to make certain that the four marks, indicating the 180 degree meridian of the frame, are all on one line.

III. Two centrally beaded short horizontal rods are used when the trial frame is adjusted on the patient's face. The trial frame is so positioned that each rod is opposite one of the external canthi of the patient. (The internal canthi are disregarded.) This brings the horizontal meridian of the frame directly opposite the horizontal meridian of a patient's face, viz., a line extending from external canthus to external canthus. This is the *Base Line* from which all axes are worked off.

IV. The straight temples are delicately yet firmly and separately adjustable as to tilt at any angle, and as to lateral pressure by four adjusting knobs, two on each side of the frame. Tilting both temples equally tilts the plane of both trial lenses. Tilting one temple more than its fellow raises the corresponding temporal end of the trial frame. (The lowering of one cell independently, as is done in some trial frames creates an almost insurmountable incoordination between refraction and spectacle and eyeglass fitting. See Fig 7, page 485, Vol. 3, A. J. O., July, 1920.)

V. Thin spherical and cylindric test lenses, exactly centered, are used. The axes of the latter are distinctly marked *on the lenses* at *geometrically* opposite points. When placed in the trial frame at the 180 degree axis—both marks on each cylindric trial lens are seen to hit off correctly with two 180 degree marks on the trial frame, thus verifying the markings each time a cylindric test lens is placed in the trial frame. The trial lenses are large, the diameter of the cells being 38 millimetres. (The use of a small cylindric lens is equivalent to working with a very short arc. The movement of such a lens over a five degree arc represents a very minute excursion. The movement of five degrees of the larger lenses is an appreciable and discernible excursion.)

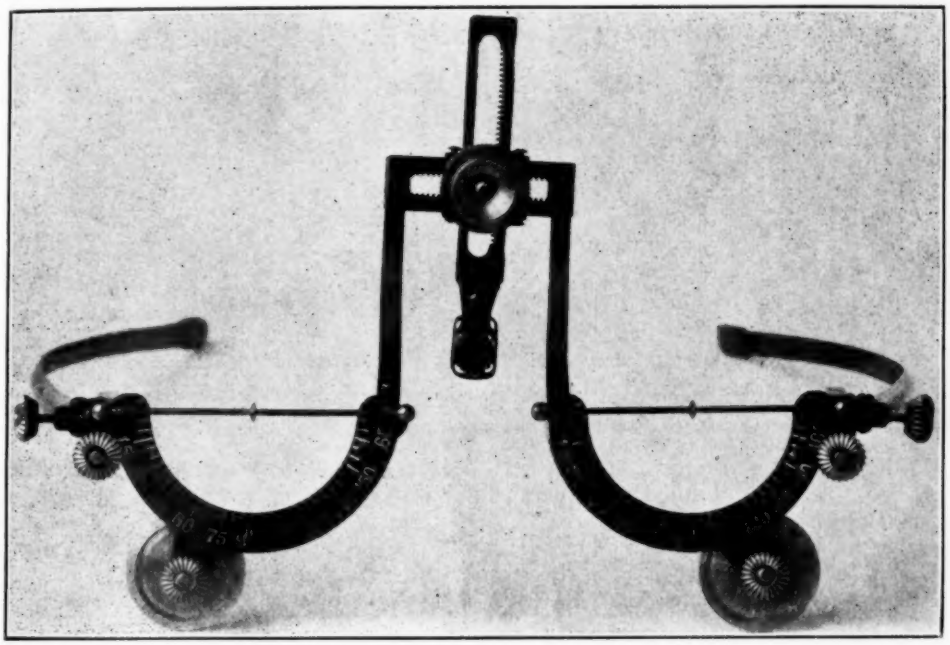

Fig. 2. Each one of the short horizontal rods should be opposite an external canthus when frame is correctly levelled on the patient's face.

As has been mentioned, the straight line crossing the four 180 degree markings on the axis scales of the trial frame, is brought exactly opposite to a straight line crossing the two external canthi of the patient. Subsequently, glasses are so adjusted that a straight line, white pencil marked across the entire horizontal meridian of a pair of spectacles or eyeglasses, is brought into the identical relation to the external canthi of the patient.

As to Height: The refraction is done with the centers of the trial lenses placed on a level with the external canthi. Subsequently, a pair of spectacles or eyeglasses is adjusted so that the optical and geometric centers of the correcting lenses are at the identical height.

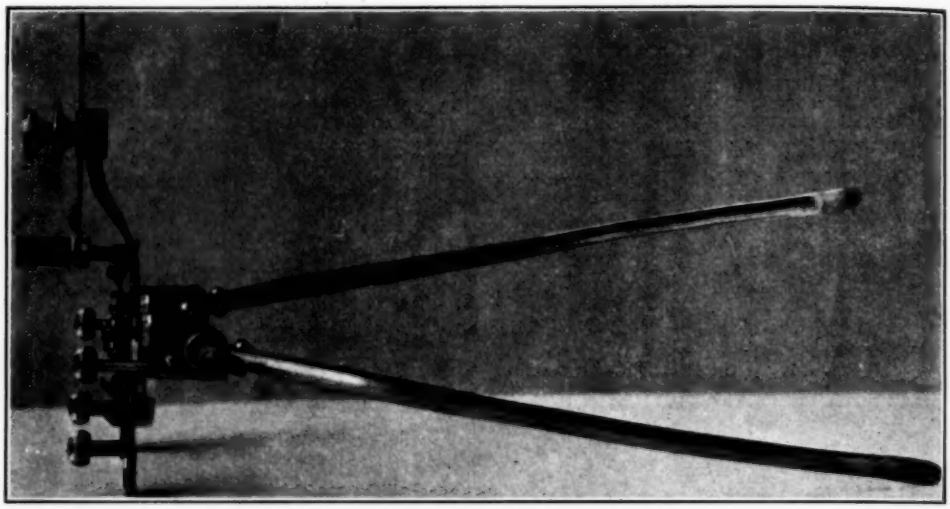

Fig. 3. When one ear is higher or the face asymmetric, it becomes necessary to tilt one temple more than the other to bring the continuous horizontal line of the trial frame front opposite and parallel to the line extending from external canthus to external canthus.

As to Tilt: Refraction is done with the planes of the trial lenses tilted at an angle parallel to the orbital aperture (i. e., to a line extending from the

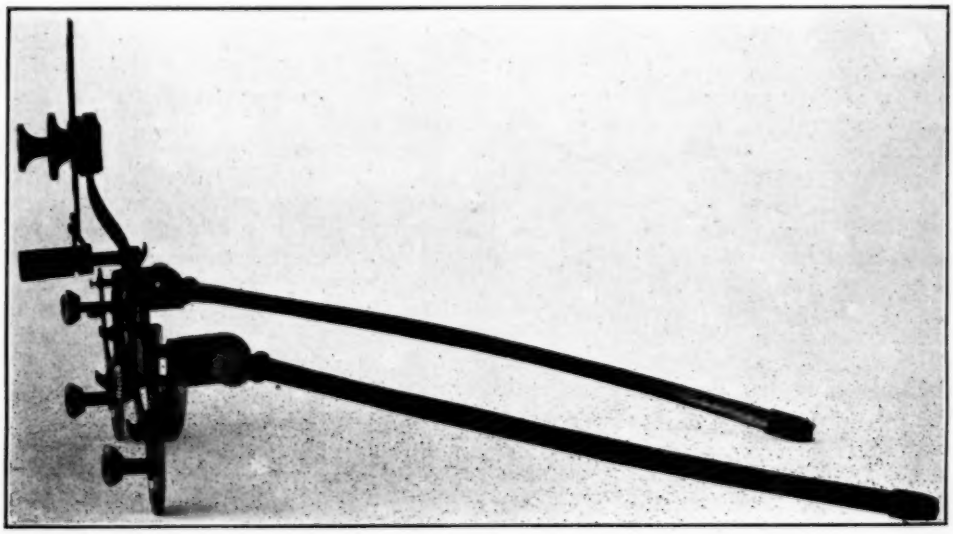

Fig. 4. When both temples are tilted equally, the plane of the trial frame front is tilted forward from the top to the desired angle.

center of the upper, sharp, thin, bony rim of the orbit, to a corresponding point on the lower, sharp, thin, bony orbital rim). Subsequently, a pair of spectacles or eyeglasses is adjusted so that the planes of the correcting lenses have the identical tilt.

My reasons for arbitrarily selecting two lateral fixed points (the external canthi) on the patient's face as determining the horizontal meridian of that face, are fully set forth in the article previously mentioned. These with the other fixed points which guide the oculist in adjusting the trial frame and subsequently his optician in adjusting the glasses, make possible the coordination of refraction with spectacle and eyeglass fitting.

HYSTERIC HOMONYMOUS HEMIANOPSIA.

JOHN L. GARVEY, M.D.

ANN ARBOR, MICHIGAN.

The case here reported was observed in the Clinic for Neurology, Hospital of the University of Michigan. Its symptoms, history and subsequent course seem fully to justify the diagnosis indicated in the title.

It is generally conceded that hemianopsia caused by hysteria is a rare condition. Wilbrand and Saenger[1] go so far as to say, "With the greatest certainty we can assert that neither central scotoma nor temporal or homonymous hemianopsia can be caused by hysteria or considered as a symptom of a purely functional neurosis. These three are always the direct or indirect result of organic lesion." According to Wilfred Harris,[2] cases of hysteric homonymous hemianopsia have been reported by Svynos, Galezowski, Rosenthal, Westphal and Bonnefoy. Harris reports a case of left homonymous hemianopsia as a period in the clearing up of the ordinary hysteric amaurosis which quite coincides with the observation of Pierre Janet.[3]

The case that I have to report is that of a woman admitted to the University Hospital on the 13th of September, 1921. She was twenty-six years old, married and a waitress by occupation. Her chief complaint was loss of the left half of the field of vision. The family and previous medical history were practically negative. In April, 1921, she was hit over the right eye by a swinging door. This blow did not render her unconscious and she suffered little pain. There was no dizziness or vomiting, at this time, and she continued her work. In June, 1921, she began to have pain over the right eye with dizzy spells and vomiting. Two days following the onset of pain she noticed that she could not see objects in the left half of the field of vision. This condition remained about the same.

Examination showed a well nourished woman who replied to questions promptly and intelligently. She seemed mentally normal. During the examination she cried considerably, held her breath and was quite concerned over her condition. There were numerous stigmata of deviation. Her gait and station with the eyes open and closed were normal. There was a medium fine tremor of the hands on extension, and she developed a tremor on the finger to nose test. There was no paralysis of the face, tongue or extremities. The pupils were equal, round and symmetric. They reacted to light and in accommodation. There was a suggestive transitory nystagmus on lateral deviation of the eyeballs.

The tendon reflexes were all present, prompt and equal on both sides. She felt pin point plainer on one side than on the other, the change coming in the midline. There was no anesthesia of the conjunctivae, but glove and stocking type of analgesia to pin point. The examination of the lungs, heart and abdomen was negative. Examination in the Otology Clinic (Dr. R. Bishop Canfield) was reported negative for objective signs in the nose and throat.

Bárány tests showed no localized lesion. Examination in the Ophthalmology Clinic (Dr. Walter R. Parker) showed the fundi to be practically negative, except for slight endarteritis and slight edema of the retina. The visual fields showed left homonymous hemianopsia. See figure 1.

An X-ray of the head showed the sella turcica to be well outlined, normal in appearance, with no evidence of recent or old fracture or other abnormal appearance. A Wasserman test on the blood was negative. The blood pressure was 110/90 and the examination of the blood and urine was essentially negative.

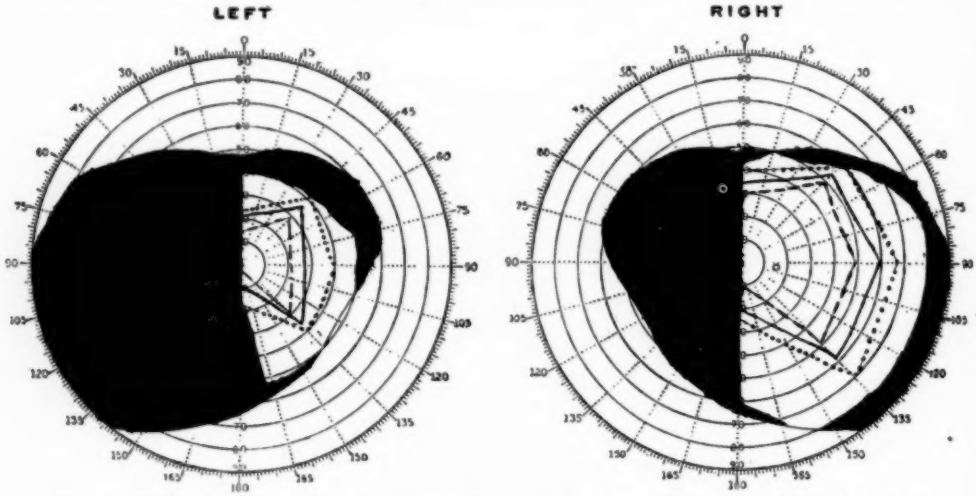

Fig. 1. Fields of ision showing homonymous hemianopsia which proved to be of hysteric origin. (Garvey)

A diagnosis of left homonymous hemianopsia of hysteric origin was made on the finding of definite signs of hysteria and negative findings for organic disease. Shortly after being admitted to the hospital, she had two attacks definitely hysteric in type. She was treated by static electric treatments and suggestion.

Five days later she had no complaints. She said, "My eyes and nerves are a lot better." The neurologic examination at this time was the same as on previous examination, except there was no evidence of tubular vision or hemianopsia and the patient was discharged from the hospital.

In a letter, seven months following her discharge from the hospital, her family physician states she is well.

It seems reasonable to assume the etiology of the hemianopsia to have been hysteric. There was no evidence of a toxemia, and the blow on the head does not seem to have been sufficient to cause a fracture of the skull. The negative X-ray report, with no history or signs of other cranial nerve involvement, seems to rule out fracture of the skull. Multiple sclerosis might give such visual disturbance, but the mode of onset and paucity of other clinical signs of multiple sclerosis makes such a diagnosis improbable. Ophthalmic migraine might also be considered, but hemianopsia accompanying this condition is usually of short duration. The most conclusive evidence is the fact that the condition, then of many months' duration, cleared up following static electric treatments and suggestion.

I wish to thank Dr. C. D. Camp for permission to report this case and for his helpful suggestions and criticisms.

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1. Wilbrand and Saenger. Neurologie des Auges, vol. iii, 2, p. 1043.
2. Wilfred Harris. Brain, 1897, p. 308.
3. Pierre Janet. La Presse Medicale, 1899, p. 243.

NOTES, CASES AND INSTRUMENTS

DIVERGENCE PARALYSIS.

L. WALLER DEICHLER, M.D.

PHILADELPHIA, PA.

Read before the Section on Ophthalmology, College of Physicians of Philadelphia, March 16, 1922. See p. 733.

Divergence paralysis is not a common condition. It is one of a primary convergence excess and is characterized by a convergent strabismus and homonymous diplopia, greatest in degree for distance; and both diminishing as the point of fixation is approached toward the face, until at some comparatively near point the squint disappears with the attainment of single vision and orthophoria.

Cases of this kind have been reported as secondary to abducens paralysis, which this condition superficially resembles. But true paralysis of the sixth nerve never produces a strabismus and diplopia which diminish, or remain the same as the eyes are carried to the right or left. Nor are the excursions of both eyes of normal extent, both of which points distinguish divergence paralysis.

Berry believes these cases to be spasms of convergence. But here the eyes are thrown into a position of extreme convergence at every attempt of fixation of the object whether it be far or near, and especially in fixing upon a near object, particularly as it is brought closer and closer to the eyes.

This case then, which exhibits all the characteristics of true divergence paralysis, may be of interest. The history is as follows:

Miss A. C., 48 years of age, reported January 24, complaining of double vision. She had always enjoyed good health with no ocular complaints until last Thanksgiving day, when she noticed a sudden impairment of sight which has grown progressively worse, and for the past two months everything appears double.

Examination at this time gave: Vision of 20/30 in each eye, both with and without glasses.

External appearance, cornea and anterior chamber are normal in each eye. The pupils are equal and react promptly to light and accommodation. There is an alternating convergent strabismus, fixing either eye but with a slight preference shown for the left eye. The ocular movements of each eye are normal with no limitation in any direction.

At 20 ft., there is 24° of esophoria, the left eye fixing. With the test object held at a distance of 1 meter from the face, there is homonymous diplopia in all fields; and as the object is brought nearer, the images approach each other; until, at a distance of 5 in. from the face, the squint disappears with single vision. This is retained as the light is carried to the right or left of the vertical center for about 20° on either side, when one or the other eye remains fixed while its fellow turns in with reappearance of the diplopia.

While the light is directly in front and 1 meter away from the patient, both images are on the same level and parallel, but, when it is carried to the right or left, the images approach each other and are closest together in extreme abduction, remaining however on the same horizontal level and parallel thruout. With the object held at this same distance from the face, the images remain on the same level and are parallel in all parts of the vertical field.

This condition has remained about the same as when first seen, except that on February 14, single vision was obtained when the light was held 14 in. from the face.

Duane states that true divergence paralysis develops suddenly and is often caused by organic brain disease. In this case there is the suggestive sudden onset, and in addition, there has been a progressive loss of health and strength with the development of a peculiar ashen gray tint to the skin, suggesting organic disease but without localization. The laboratory examinations of blood and urine and the X-ray are all negative.

FIBROUS THICKENING OF UPPER LID FOLLOWING DIPHTHERITIC CONJUNCTIVITIS.

FRANK A. MORRISON, M.D., F.A.C.S.

INDIANAPOLIS, INDIANA.

Jan. 6, 1922, W. V., age 15, living in a neighboring town, was brought to the office by his father. According to the father, the boy had gone to school Jan. 2 as usual, but toward evening complained of something being in his left eye. Next day the eye was greatly swollen and discharging. He was taken to his family physician and treated without definite diagnosis and finally sent to me on Jan. 6.

At the time of the visit, the boy seemed very sick and was almost carried into the consultation room. The left lid was intensely swollen with a bloody serum streaming from it. A membrane protruded from between the lids. The preauricular glands were swollen, temperature 102° F., and the general physical depression marked. The ocular and palpebral conjunctiva were covered with a grayish adherent membrane. Cornea clear. A hurried examination of a scraping by a pathologist in the building confirmed the diagnosis of diphtheritic conjunctivitis.

Upon learning of the diagnosis the father elected to take the boy home and place him under the care of his family physician. Accordingly he was at once given 10,000 units of antitoxin, a solution of permanganat of potash for irrigation of the eye, and returned to his home. Nothing more was heard of the case until Feb. 1, when the boy again presented himself in company with his father and a letter from the physician requesting me to enucleate the eye. The father stated, after going home the membrane extended into the nose, and a culture sent to the laboratory confirmed the diagnosis of diphtheria. He had been given 30,000 units of antitoxin during the course of the illness.

The upper lid now completely covered the lower lid. It was hard and fibrous to the touch. No view of the cornea could be gotten until a canthotomy had been made. This was done under local injection of novocain and the lid partially everted. The cornea was hazy in the center and devoid of epithelium. The exposed conjunctival lid surface, pale and rough, had the feel of fibrocartilage. Under novocain injection, a large piece of the lid extending into the fornix was removed. There was little bleeding and it cut like dense fibrocartilage. The piece removed at this time was roughly three-quarters of an inch in length and a quarter of an inch in breadth. A borated ointment with atropia was prescribed and the boy went home.

At the next visit three days later the excised part had been almost replaced and a like section was again made. Without going into details, these sections were repeated at increasing intervals until eleven such had been made, and the amount of tissue removed was considerably larger than the thumb. The amount of tissue removed at each section was less than at the preceding as there appeared to be but a partial replacement of tissue after each section.

The ultimate outcome was good. A very faint scar marks the place of the corneal abrasion and a slight ptosis remains. The specimen submitted to the laboratory brought out the report that it was almost a pure fibroma, and one gentleman unacquainted with the history of the case volunteered the opinion it was "of very slow growth."

A COMBINED PERIMETER AND SCOTOMETER, SIMPLE AND EFFICIENT.

EDWARD J. BROWN, M.D.

MINNEAPOLIS.

When I read in the presessional volume of the recent International Ophthalmological Congress Col. Elliot's assertion that mapping of the visual field should be done circularly and not radially, and that those of us who had done the latter had done bad work, it occurred to me that I could make a very simple instrument for the

purpose. I have always believed that there was great advantage in the distant fixation employed by Schweigger in his hand perimeter, and followed by me in the small instrument presented to the American Academy of O. and O.-L. in 1917.

The base of my new instrument is a brass tube 24 inches (60 cm.) long

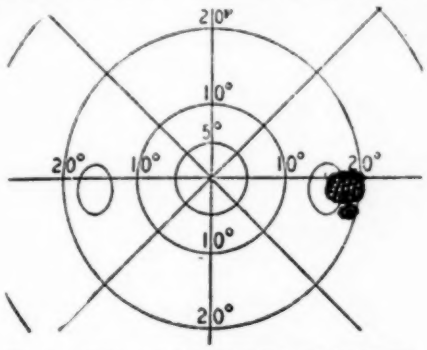

Fig. 1. Field of vision as taken on the Peter campimeter.

and 3/8 inch (1.4 cm.) in diameter. To the proximal end is attached a handle and at a distance of 5 cm. a strong brass wire ring 5 cm. diameter to apply around the eye to be tested. On a 2.5 cm. long brass tube of size to move easily over the longer tube, a 10 cm. square of light brass is mounted, to which is soldered a sufficiently long wire to serve as a carrier for the target. This wire is bent sufficiently to bring the end to the position of alignment with the front of the eyes, or 90 degrees. Opposite this target carrier is soldered an amount of brass to balance it.

Any length of radius desired may be used, the conventional 33 cm. or otherwise. I have adopted 22.6 cm. for the outer field radius, and 7.6 cm. for the paracentral field. It is perfectly obvious that when the sliding tube is so placed that the target is at the vertical

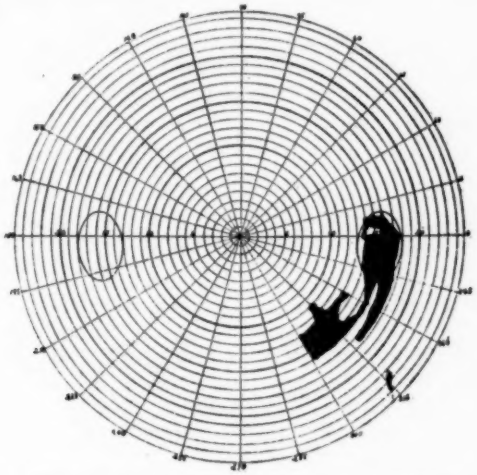

Fig. 3. Map of same field taken on combined perimeter and scotometer

plane of the eyes, the slide will register 90 on the long tube. When the slide moves forward the length of the radius, 22.6 cm., the registration will be for 45 degrees, and it is an easy trigonometric proposition to determine the place on the tube corresponding to each five or ten degrees of arc.

With the radius 22.6 cm., it is easy to map out the peripheric limits; and the scotomata which may be present in any part of the field down to 21

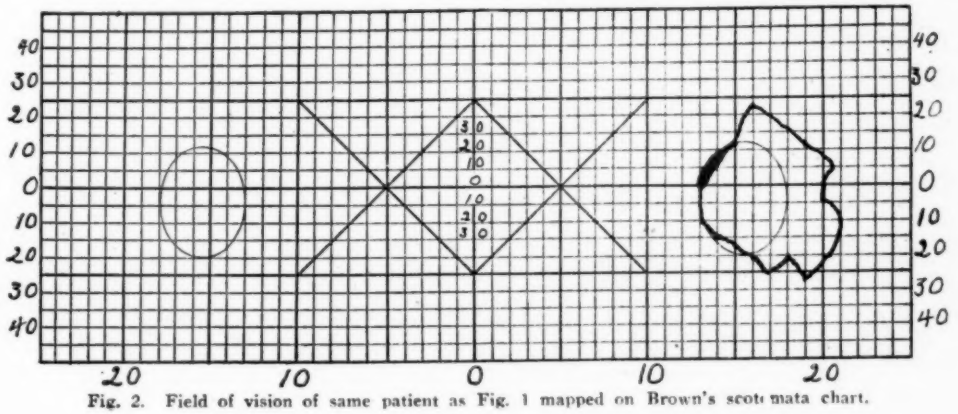

Fig. 2. Field of vision of same patient as Fig. 1 mapped on Brown's scotomata chart.

degrees. With the radius 7.6 cm., the paracentral region may be mapped including the blind spot of Mariotte and down to about 8 degrees. By making the long tube 1 meter the field can be mapped to five degrees.

A still simpler instrument, which I have made, has a strong steel rod 3/16 inch diameter instead of the tube, but it has the disadvantage that there is not sufficient room for marking the degrees, except by marks which have to be counted. When an eye has insufficient central vision to see thru the tube the sighting may be at the end of the tube or along the top of it, which will give only a negligible error.

My limited use of these instruments indicates that fields may be much more rapidly and completely mapped than with other instruments with which I am acquainted, and with decidedly more ease and comfort for both patient and surgeon.

The accompanying charts show the results of measurements of the blind spot of a patient of Dr. Charles Nelson Spratt by the Peter campimeter, the Brown scotoma map and this new instrument.

SOCIETY PROCEEDINGS

Reports for this department should be sent at the earliest date practicable to Dr. Harry S. Gradle, 22 E. Washington St., Chicago, Illinois. These reports should present briefly the important scientific papers and discussions.

CHICAGO OPHTHALMOLOGICAL SOCIETY.

May 15, 1922.

Dr. E. K. Findlay presided.

Prof. Ernst Fuchs of Vienna was the guest of honor.

Ectropion of Left Lower Lid.

Dr. Michael Goldenburg presented a man, aged 87, who came to the hospital on October 28, 1921, with an ectropion of the left lower lid, due to a complete paralysis of the left facial. In view of the age of the patient it was thought advisable, in order to save the eyeball, to stitch the lids together.

At the time of presentation the facial paralysis was much improved, and it was thought that the lids would be separated a little more toward the inner canthus to permit the patient to see a little better. Diagnosis by a neurologist was hemorrhage into the internal capsule.

Sarcoma of Eye.

Dr. Goldenburg then presented a woman, aged 34, a housewife, married 15 years, who had five children, all living, no miscarriages. She first noticed a protruding of the right eye last November. It had progressively become worse, but she stated that it was somewhat improved in the last few days. At onset she had severe headache, involving the area around the right eye. This pain was accompanied by weakness. Examination showed the right eye protruding forward and outward, and could not be replaced. Left eye negative. Vision, right eye 15/200. Vision, left eye 15/20 minus 2. Right and left pupil reacted to light and accommodation.

Fundus: Right media clear. Temporal side of disc could be defined. Nasal side tilted forward and lost in surrounding tissue. Some tortuosity of vessels, particularly on nasal side, as if there were some bulging on that side involving the whole eyeball. A vertical wrinkling of the retina was noticed. No hemorrhages visible. Left, media negative. Disc fairly well defined, shallow saucer cup. Vessels, retina and macula negative. Right antrum was irrigated with difficulty, but no discharge was found. Nasal examination disclosed septum slightly deviated to the left. Inferior turbinate normal. Middle turbinate pressed against septum. Upper part of nasal vault pretty well closed up. Slight discharge from right middle meatus. Blood Wassermann negative. Radiogram showed a complete blocking of the right antrum, right ethmoid and right frontal sinus. The rim of the

right orbit in the region of the frontal sinuses and the ethmoids showed a marked destruction. This condition was evident in the anteroposterior view and in the perpendicular view. The lateral view showed a marked apical abscess involving the superior right first and second molars. An attempt was made to irrigate the right antrum, but when the trocar was introduced no water could be forced in until the trocar was partially withdrawn, indicating that some part of the antrum was filled. The suspicion based on radiographic findings was that it was a sarcoma.

Coloboma of the Macula.

DR. A. P. HUNNEMAN presented a boy who came into the hospital because of poor vision. During the routine examination, the interesting condition was found and diagnosed as a coloboma of the macula. The term "coloboma of the macula," however, should only be used in a topographic sense, to indicate a partial atypic coloboma of the retina and choroid, since the macula is not developed in the fetal cleft. These colobomata are supposed not to be hereditary but may be congenital.

These cases were rare, and might be mistaken for choroidal changes. About 46 cases had been recorded up to 1916. Usually the horizontal oval diameter was 1 to 10 disc diameter. There was generally some ectasia, 1 to 6 D., maxium 10 D. The edges were usually sharp and showed a line of pigment. There was often a yellowish zone outside. The surfaces might show patches of pigment. Where coloboma was unpigmented it had a pearly glistening color. As in other colobomata, there were retinal and ciliary vessels. Large branches of the ciliary vessels might emerge from the floor. Coincident anomalies were rare.

The refractive error in this case was myopia. Vision of the right or affected eye was 18/200 and of the left 20/20 with correction. The size of the coloboma was about 4 and 3 disc diameters, with an ectasia of 6 D., and was slightly pigmented on the nasal side.

Uveitis, Bullous Keratitis, Hypertension.

DR. T. D. ALLEN presented a young lady, referred to him in November, 1921, with a history of pain in the right eye extending over a period of eleven months. Examination showed the right pupil widely dilated (atropin). Vision, hand movements, and at times fingers at a few feet. The cornea was steamy, particularly the lower half, and a large bulla could be seen on it. The anterior chamber was quite deep, and there were spots on the posterior surface of the cornea. There was slight edema of the conjunctiva. Tension was considerably increased to the fingers. The use of eserin reduced the tension to a marked degree. The fundus could not be clearly seen.

The following day the bulla on the cornea had completely disappeared; the tension was 60 mm. of mercury, whereas in the left eye it was 24 mm.; eserin was again used and the tension came down. A diagnosis of uveitis with bullous keratitis and hypertension was made. The patient was sent to the hospital where careful general examination revealed no gross abnormality. The sinuses were investigated, the ethmoids and sphenoids on one side completely cleaned out, and the tonsils cleanly removed without relief. Teeth negative, and tuberculin tests negative.

Finally, a paracentesis was done, with relief for about one week; when the tension again went up and remained high, in spite of miotics or mydriatics. After further study it was decided to give some foreign protein intravenously. This gave immediate relief. The first dose, which gave a chill and temperature of 102°, reduced the tension; the eye became white for the first time in months and all subjective symptoms were relieved. There was a relapse, so the dose was repeated, and in all seven injections of typhoid vaccine were given.

The patient then left the hospital and was watched at home for a time, but the condition recurred. Owing to the history of pus tubes after marriage some ten years before, she was put on g. c. vaccine, but as there was no sys-

temic effect after increasing the dose to 4,000,000,000 it was discontinued and another dose of typhoid vaccine was given. This caused a marked reaction, and since that time there had been no return of tension, the eye had remained white, there had been no subjective symptoms, the patient had felt better and gained weight. The bullae on the cornea, tho smaller, had continued to form about once a week.

Soon after performing the paracentesis, all of the epithelium was removed from the lower two-thirds of the cornea. The membrane of Bowman was scraped and iodin applied. Three days later a bulla appeared on that place. At presentation the vision was 20/50 in the right eye, and there was a small organized exudate in the posterior chamber at 6 o'clock, which was visible with the naked eye when the pupil was dilated. There were also still many deposits all over the posterior surface of the cornea. The left eye had been perfectly normal at all times.

Discussion. Professor Ernst Fuchs, of Vienna, believed that in this case, if the cornea was scraped and the vesicle examined, a fine new membrane would be found under the epithelium. The steaminess of the cornea, in an attack of glaucoma, acute or chronic, was due to the accumulation of droplets between the deeper layers of the epithelium, due to the high tension. If the tension dropped, the steaminess might disappear within 1/2 hour to an hour, as these droplets were absorbed. In cases of long standing, these droplets coalesced and formed large accumulations of liquid beneath a newformed thin connective tissue membrane, lying between the epithelium and Bowman's membrane. Bowman's membrane was perfectly smooth, and it was easy to understand that such a membrane superimposed on it was not firmly attached and could be easily detached by the accumulation of fluid. On attempting to remove the vesicles by scraping, a great part of the epithelium could be removed, sometimes almost the entire epithelium, which could not be done with a normal epithelium. Microscopic examination showed a fine membrane connected with the epithelium. He had removed the vesicles and touched the exposed corneal stroma with iodin and knew of nothing better. This had to be repeated in some cases.

Melanotic Epibulbar Tumor.

Dr. William H. Wilder presented a young unmarried woman with a melanotic growth on the temporal side of the left eye, which was visible even at a distance. This growth appeared about eight years ago, beginning near the temporal limbus. It gradually increased in size, became slightly elevated and encroached on the corneal limbus. She was seen two years ago, and the diagnosis of melanotic sarcoma was made, and the customary treatment of enucleation advised. The patient had never had any pain, the vision was normal, and there was no sign of disturbance inside the eye, so the patient refused to accept either the diagnosis or treatment.

Radium therapy was instituted and she had received thirty or forty applications of 100 mgs. radium for as much as fifteen minutes at a time. For a time this seemed helpful, and a peculiar change had taken place. Evidently from the effect of the radium, the pigmented cells had been dispersed and could be seen scattered over the conjunctiva. The growth had not decreased, but was extending and encroaching more and more onto the cornea. Dr. Von Der Heydt had examined the eye with the slit lamp, but could find no evidence of new pigmentation in the interior of the eye.

The case was interesting because of its chronicity. Melanotic sarcomata usually grew rapidly, but this growth had existed for years. Dr. Wilder wondered if they might be mistaken as to the exact nature of the growth, and whether it might be a *pigmented epithelioma.* These were rare, but did exist. This surmise had been strengthened by Dr. de Schweinitz, who saw the case and thought because of the chronicity it might be this type of growth.

The patient disliked to part with an eye that had normal vision, but he

believed a radical enucleation was indicated.

Discussion. PROFESSOR FUCHS thought this was a most extraordinary and interesting case from several points of view. First, as to its nature, whether it was sarcoma or carcinoma. Because of the pigmentation it looked like a sarcoma, while the flat, superficial growth on the cornea resembled a carcinoma. The principal question was whether it might be a pigmented carcinoma, but he is doubtful of the existence of a real melanotic carcinoma. They had often been described, but he had never seen one that he was satisfied should have that diagnosis. In the cystic carcinomas, it was found that they usually started from a nevus on the limbus, being therefore of mesodermic tissue. He did not believe these were actually epitheliomas, but that they were really sarcomas, because when they grew they developed into regular sarcomas, altho they looked like carcinomas in the beginning.

Another interesting feature of this case was the scattering of the pigment around the tumor. There was a well circumscribed tumor, but for a distance nearly one centimeter away, the conjunctiva was filled with scattered pigment. He thought these were particles carried away from the main tumor, perhaps thru the lymph current, and perhaps by phagocytes. Such cases had been described, and he had seen one, in which after a blow on the eye there was a subconjunctival rupture of the sclera. The iris had become detached all around and had been expressed thru the wound under the conjunctiva. In those cases the pigment of the iris became free by necrosis of the iris and was scattered all over the eyeball, so that the whole white of the eye had become dark. He believed the appearance in this case was due to the same dissemination of pigment by lymph or phagocytes, probably because of the radium therapy. It had become free because of necrosis of the tissue of the tumor.

As to the treatment, he thought the safest plan would be to remove the eye, together with all of the conjunctiva containing pigment. The prognosis was very different in sarcoma and epithelioma. If it was sarcoma there was great danger of metastasis. He knew of several cases in which after removal of a small sarcoma, or melanoma, of the limbus, the patient had succumbed within two years. As the patient did not want to part with the eye, the best thing would be to make an extirpation of the tumor, cauterize the surface with the galvanocautery and treat it afterward with radium and examine the excised tissue. If it proved to be sarcoma, the eyeball should be removed at once. If it was carcinoma it was not so dangerous, altho there might be local recurrence. He did not know whether there was a history of nevus in this case or not.

(Dr. Wilder said that the patient reported a small pigmented spot on the cornea having existed before.)

DR. FUCHS said if that was the case the condition spoke in favor of a previous nevus, and it was now probably a melanotic sarcoma. This was much more likely as the patient was not of the carcinoma age.

DR. WILDER thought that while the pigmented epithelioma were very uncommon, probably every one who had done much pathologic work had seen some cases. He recalled one case with a sort of cauliflower growth, that developed in the limbus of the eye of a negro. He did not advance the view that the present case was of that nature, but had thought from the beginning that it was a melanotic sarcoma, particularly because of the firm, pigmented growth usually described, but the chronicity of the case made him doubt this. The woman had a very dark complexion and the irides were distinctly dark, which might account for the appearance. He was inclined to think the best measure was enucleation, but the patient had not yet consented.

With all due respect to Professor Fuchs, he would hesitate to make a section for the purpose of diagnosis. He had refrained from this, because in America we had been educated up to the belief that the less one meddled with a suspicious growth for the pur-

pose of a histologic examination, the better for the patient.

Nodular Keratitis.

DR. C. O. SCHNEIDER presented a case of a young woman, aged 36, with a rare and interesting corneal condition (nodular keratitis), which he had first seen three weeks before. She had been troubled with inflamed eyes as long as she could remember. Her mother told her this started following measles as a small child. One sister, now dead, had a similar trouble in the left eye. She thought the condition was progressing and vision was diminishing. Her vision at this time was R. 20/200 and L. 10/200. When she was first seen, there was also one small area on the cornea that was ulcerated and stained with fluorescein, but under treatment this cleared up and did not stain by the following week.

On the cornea of the left eye were six to eight elongated, irregular, white patches, each approximately two millimeters in length. The surface of these areas was quite rough, and they projected distinctly above the surface of the healthy cornea. The right eye also had a similar opaque area, ribbon shaped and extending over half way across the cornea. At presentation none of these areas stained.

A record of the same patient made ten years ago at the Infirmary had been found. The case was then diagnosed as keratitis eczematosa. The vision was R. 20/200; L. 8/200. The description of the lesions was much the same as the present findings, and the fact that the leucomas were elevated was also mentioned. There was then present redness, pain, photophobia and lacrimation, which, however, were not marked symptoms at the present time.

Discussion.—DR. HARRY GRADLE said this case was very reminiscent of a case shown by him some time ago. Dr. Jackson, of Denver, also saw the case. He called it keratitis marginalis vesiculosa. That patient showed much the same condition as this one, but in both eyes. On the cornea, about 1 mm. from the limbus, were small vesicles, which were elevated about one-half millimeter. These vesicles were filled with perfectly clear fluid. Upon evacuating the vesicles, the corneal epithelium sank back and left an area which was very similar to those in this young woman's eyes. These were in a crescentric form over the entire limbus, so that the eye resembled the contour map of the foothills. The slit lamp threw no light on the case, and he had found no treatment of value, with the exception of possible thinning of the areas by dionin. In response to a question from Dr. Fuchs, Dr. Gradle stated that the lesion went deep, below Bowman's membrane, and the vesicle was composed only of epithelial cells.

PROFESSOR FUCHS thought this did not look like vesicle formation, but those who had seen the case, of course, knew more about it. He would have considered the case as related to the keratitis nodosa of Groenouw. In those cases, the elevations were not filled with fluid, but were solid. If one of the opacities would be removed for examination, he advised putting it first in glacial acetic acid and then staining it according to the Giemsa method. In this way the two substances contained between the corneal lamellæ were very well shown.

Progressive Opacity of Cornea.

DR. ROBERT H. BUCK presented a colored man, who stated that about eight months ago he noticed failing vision in his left eye. He had no pain, and the eye was only slightly reddened. A white spot appeared in the cornea, and this had been growing gradually larger while vision had been failing rapidly. Examination revealed vision of 20/200 in the right and no vision in the left eye. He had marked nystagmus, which had been present since childhood. The left cornea showed some opacity, and there was an amount of organized exudate in the anterior chamber, adherent to the lens. The iris was degenerated and the lens was opaque. Tension was very low. The condition was suggestive of intraocular tumor or a long continued iridocyclitis. Transillumination was unsuccessful.

Discussion.—PROFESSOR FUCHS said this was a very doubtful case, and he thought it was impossible to tell what

it might be. In regard to the transillumination, he had learned in this country that the eye of a really black negro could not be transilluminated.

In reply to a question Professor Fuchs said: That dystrophies were so extremely manifold and some of them so rare, that one man scarcely saw two cases alike, so that it was impossible to class them as a definite disease. It was hard to tell what was typical when one saw only single cases. Many of them were probably related to the keratitis of Groenouw, as the lattice keratitis and others, attacking often several members of the same family. There were other cases in which there was infiltration with fat or lime salts, and others in which the cause was unknown. In some cases it was said that the internal secretion was the cause, but there was no definite proof of this. Sometimes after a thyroidectomy opacity of the cornea followed. Similar cases had been observed in myxedema, but these cases were very rare and exceptional. It might be that in these cases some disturbance of internal secretions was the cause, but nothing definitely was known about this.

Dr. Robert Von Der Heydt asked Professor Fuchs if he had seen any of the corneal cases Haab had described as buchstaben-keratitis and considered as possibly tuberculous.

Professor Fuchs replied that he had seen a case, but it was not tuberculous. Some observers considered keratitis nodosa as tuberculous, but this was certainly wrong. He had examined some of the cases histologically and there was no trace of tuberculosis.

Robert Von Der Heydt,
Corresponding Secretary.

SECTION ON OPHTHALMOLOGY, COLLEGE OF PHYSICIANS OF PHILADELPHIA.

March 16, 1922.

Dr. McCluney Radcliffe, Chairman.

Unusual Type of Cataract.

Dr. Warren S. Reese (by invitation) exhibited a male patient, aged 29 years, with bilateral cataract. The lens presents a 5 mm. circular opacity, occupying the pupillary area, and in the anterior cortex, thru which a fair fundus glare is obtainable. In the center of this opacity are numerous other, perfectly opaque, nodular opacities. These extend almost to the periphery of the large circular opacity.

Discussion. — Dr. William Zentmayer said the type of cataract shown by Dr. Reese is probably that pictured by Bach and also by Collins, and described by the former as a case of lamellar and central cataract. The arrangement of the denser opacities in the center of the nucleus resembled somewhat that of coralliform cataract, but they have a waxy rather than a crystalline appearance. It is probable that these opacities within the zonular region are due to accumulation of granular matter in the lines of separation between the different layers of the lens—the socalled "lens star."

Dr. Burton Chance said that he was greatly interested in Dr. Reese's case by reason of the fact that he discovered that the young man had been under his own observation a number of years ago. Indeed, he was one of five in a family presenting in each eye, the same form of cataract. These disciform cataracts are known in the literature as the "Coppock," from the name of a family among which Nettleship and Ogilvie found seven generations so affected. Chance's cases were reported at the meeting of the Ophthalmological Society in 1907. None of the family has been seen by Chance since then, but he immediately recognized the man's eyes. He would only add, that so far as he is able to recall to his memory the unusually accurate drawings by Miss Washington, the cataracts have not changed in size or density, nor the eyes in their refraction. It is of additional interest to learn that the young man was accepted for military service in 1918.

Localized Cataract With Unusual Fundus Changes.

Dr. Warren S. Reese (by invitation) exhibited a male, aged 28 years. Three years ago he was struck in the

left eye with a hand grenade fragment. He now presents no external evidence of injury. Thru the dilated pupil a localized opacity of the lens can be seen in the extreme nasal periphery. From this point a rather wide silvery band runs backward thru the vitreous and, as it reaches the posterior pole, expands into an area of choroiditis just up and in from the disc. In the lower nasal periphery there is a localized detachment of the retina. Notwithstanding the above changes, the patient's vision is improved to 15/20 with a —2.50 sph. ⊃ + 6.00 cyl. axis 90°. A small foreign body has been localized by the X-ray, 6 mm. back of the center of the cornea in the horizontal plane, and 8.5 mm. to the nasal side.

Advancement and Transplantation for Paralysis of Superior Rectus.

Dr. Burton Chance presented a case of paralysis of the left superior rectus together with partial ptosis, believed to have been caused by infantile paralysis, in a young girl now sixteen years of age. A resection advancement of the superior rectus was made and slips from the lateral muscles were united to the advanced mass. The simple sutures advocated by Posey were employed. These have held securely, and marked upward movement has been obtained, with no interference with the lateral rotations.

A New Protractor Card.

Dr. Sidney L. Olsho (by invitation) showed a new protractor card for verifying the axes of the clyindric and sphero-cylindric lenses. (See p. 451.)

A New Trial Frame.

Dr. Sidney L. Olsho (by invitation) showed the mechanically perfected model of his trial frame, and described the method by which refraction is coordinated with spectacle and eyeglass fitting. (See p. 718.)

Coloboma of Disc and Retina.

Dr. Burton Chance presented a case of triangular coloboma of the temporal half of the disc and of the adjacent uveal tissues, in each eye of a middle-aged colored woman.

Artificial Tendons.

Dr. Burton Chance exhibited a case of angioma of the orbit, reported three or four years ago, in which the elevators of the globe had been involved in the vascular mass, and the young woman had never been able to rotate the eye upwards. Moreover, there was absence of check muscles and capsular tissues. It was conceived that strips of skin from the forehead might be united to the globe to serve as "check ligaments," if not as artificial tendinous structures. Accordingly, narrow strips were dissected from the superciliary region, turned on their bases and drawn thru tunnels thru the orbicular into the retrotarsal fornix, and united to the scleral tissues. These bands have held well, for over a year, and, by being on the stretch they tend to raise the lid, and have distinctly elevated the anteroposterior axis of the globe, greatly improving the girl's appearance as well as adding to her comfort by reason of the backward pull which they exert.

Pneumococcic Ulcers.

Dr. William Zentmayer exhibited a man who had been admitted to the Wills Hospital about four weeks previously with an extensive pneumococcic ulcer. Under the use of Shahan's thermophore and the use of ethylhydrocuprein, the ulcer healed without perforation. At present the anterior chamber is of normal depth and there is a scar covering two-thirds of the central part of the cornea, grayish in color. The patient was exhibited as showing the result of what might be termed the modern treatment of pneumococcic ulcers, and also to call attention to a possible danger in the use of ethylhydrocuprein.

He also referred to a woman, 37 years of age, with dacryocystitis, who had had injected into the sac thru the canaliculus several drops of a 1% solution of ethylhydrocuprein, besides having had the sac washed with mercurophen after the use of holocain. One hour later she complained of excruciating pain and exhibited an exfoliation of the epithelium of the cornea, over a sur-

face of 5 mm. in diameter. Fortunately there was no longer any discharge from the sac, as this had ceased after the second treatment. At first the thought was that the epithelium had been abraded either by the probe or as the result of the combination of chemicals used at one sitting. However, as Dr. Ball, of St. Louis, in a personal communication stated that he has seen this occur more than once, after the use of ethylhydrocuprein, and Dr. Bedell, of Albany, has seen such a result following the use of the drug in rabbits, it is more than likely that the ethylhydrocuprein was responsible. The solution used had been prepared a week previously for the treatment of the same condition in another patient (also cured) and was therefore not entirely fresh.

Discussion.—Dr. Burton Chance said that as he had somewhat reluctantly adopted use of ethylhydrocuprein, he had always been cautious in administering it. He had not seen such effects as those specified by Dr. Zentmayer and Dr. Ball, follow its use; indeed, in a recent case of lacrimal sac disease, quite like that detailed by Dr. Zentmayer, he had used it with the greatest freedom he had yet exercised, without untoward results. He is inclined to believe that the unexpected action upon the cornea arose because of chemical reactions produced by the mixture of the many other solutions employed. He further believes that in the use of valuable drugs containing specific active principles, harmful or objectionable effects are produced by the chemical changes brought about by the simultaneous mixing of a multiplicity of collyria.

Angioid Streaks in the Retina.

Dr. William Zentmayer exhibited a case of this condition in a patient whom he had first exhibited in 1909 and again in October, 1914. There are undoubted changes in the appearance of the streaks. They are much less conspicuous, indeed, some portions of them are scarcely visible. The macular region in the right eye is occupied by an oval, completely atrophic area, with some pigment at its lower border. In the left eye there are hemorrhages below the macula.

Vision when first seen was: Right eye 6/9, left eye 6/6. To-day it is: Right eye 5/15, left eye 1/200.

When he came in 1909 he had a dendritic ulcer of the cornea, and he again exhibits the same condition.

Discussion.—Dr. Burton Chance said that the origin of the angioid streaks has continued somewhat a matter of speculation. To those who had the opportunity to examine many cases of military injury to the globe, the bizarre proliferation of retinochoroidal pigment frequently seen must have been commented upon. He had himself seen but few cases of angioid streaks before the war, but during his army service the thought of the resemblance of war cases to these unusual ones, had been in his mind, for had they not the same form of retinochoroidal traumatism, accompanied by pigment proliferation? And, might they not lead to similar formations as in the streaking depicted in Dr. Zentmayer's case? In each type there is the history of contusion or concussion, extravasation and development of connective tissue, and profuse wandering of pigmentary elements.

A Case of Divergence Paralysis.

Dr. L. W. Deichler (by invitation) reported a case of divergence paralysis. (See p. 723.)

Discussion.—Dr. Wm. Zentmayer said he was surprised at the statement made by Dr. Deichler that he had found but one other case in literature. Several cases have been reported by Duane and one case by himself at The College of Physicians several years ago, and recently he had given the notes of a case seen in consultation with Dr. Langdon where this condition was a complication of encephalitis lethargica. He had seen two other cases, one in a physician and one in the son of a physican.

Melanosarcoma of the Choroid with Metastasis at a Trephined Area.

Dr. George H. Cross reported the case of Mrs. H. D., aged 65, white, American, married. First seen October 20th, 1921, complaining of recurrent attacks of sharp pain in the right eye.

The father died of cancer of the nose, mouth, and throat at the Jefferson Hospital. A brother died at the age of 35, of cancer of the head at the Jefferson Hospital. Another brother operated ten years ago at Johns Hopkins Hospital had the abdomen opened and sewed up, nothing being removed. He is still living but unable to do heavy work.

History of present illness. July, 1920, after several attacks of pain in O. D., consulted an oculist. Under treatment the pain subsided but recurred at intervals. In February, 1921, a corneoscleral trephining was done, with no relief from the periodic attacks of pain. There was no vision in the painful eye, the tension was soft, the pupillary space was filled with a yellowish exudate over the lens, and a slight elevation at the trephined area. She was advised to have the eye enucleated, which was performed October 28th. Upon removal of the globe there was observed a spherical mass about 8 mm. in diameter around the nerve at its exit from the globe. The specimen was referred to Dr. Case at the Laboratory of the Graduate School of the University. Upon gross examination, there was found a grayish tumor, thru which numerous dark streaks were observed, evidently a choroidal growth, on cut section measuring 3 1/2x9 mm. with a posterior extension outside the globe and a metastatic growth at the site of the trephine scar. The lens is drawn toward the site of the trephine scar.

As the tumor is of interest only on account of its metastasis to the trephine scar, no attempt will be made to give a complete description of it. The microscopic examination of the specimen reveals it to be a melanosarcoma of the choroid extending forward along the choroid and backward along the optic nerve. The metastatic growth appears as a separate distinct mass at the site of the trephine scar, not connected with the forward extension of the tumor.

Discussion.—Dr. S. Lewis Ziegler stated that Dr. Cross' case of sarcoma had many interesting features but metatasis had occurred so early that radium applied in the socket would not have influenced the result.

He further wished to state that the interesting case of supraorbital sarcoma which he had exhibited in January as cured for more than two years, had recently been attacked with grippe which was followed by hemiplegia, convulsions and death. He had not learned further details except that there was no sign of recurrence, and vision in O. S. had improved to 10/200.

Dr. Wm. Zentmayer said that of course it is not always possible to diagnosticate intraocular growth in the presence of acute glaucoma. If the operation is done with the supposition that the glaucoma is primary, the danger of local metastasis is increased by the operation. He recalled one case in which he found that orbital metastasis had resulted from a sclerotomy done under the supposition that the detached retina was a serous one, but which proved to be secondary to sarcoma.

Specimen From Coralliform Cataract.

Dr. Wm. Zentmayer exhibited a specimen showing crystals from a case of coralliform cataract, the clinical and operative history of which was reported previously.

The specimen had been prepared by Dr. Verhoeff, who states that the fact that the crystals have the same morphology, stain the same way in eosin and carbol-fuchsin, and give the same identical reaction for protein with Millon's reagent, proves them to be identical with those which he described in a case reported two years before the American Ophthalmological Society, and which he determined to be of protein nature.

Charles R. Heed, M.D.,
Clerk.

OMAHA AND COUNCIL BLUFFS OPHTHALMOLOGICAL AND OTO-LARYNGOLOGICAL SOCIETY.

February Meeting, 1922.

Binocular Injuries by Glass.

Dr. J. M. Banister reported serious wounding of both eyeballs by glass

fragments from a shattered wind shield in an automobile accident, with late effects of local infection.

He saw this patient at the Hospital about ten hours after the accident, and found that both eyes had been deeply wounded by glass fragments from the wind shield. In the right eye the globe had been cut thru the cornea and iris, and the lens wounded and twisted on its axis, the inner margin forwards. Hemorrhage had occurred in the anterior chamber. The cut extended from about 2 mm. above the corneal limbus straight downward to a point 2 mm. below the lower margin of the cornea. The wound was blocked behind by the coming forward of the iris and lens. The left eye had a cut about five-eights of an inch in length above the cornea, extending thru the ciliary region and opening the globe extensively, so that vitreous humor was escaping. Under local anesthesia, conjunctival flaps were brought down to cover this wound. This eye has collapsed to quite a degree and is lost.

The right eye contains some degree of vision. Of late an iritis developed suddenly, with marked injection of the globe. X-ray examination showed two infected teeth. Dr. Depecher removed the teeth and diseased bone surrounding them, about twelve days ago, and the eye began to improve at once. By examination of the patient, the result can be seen, as well as an idea secured of the severity of the original injury. The eye which was totally blind has never been inflamed or tender. It should be stated that some weeks before the secondary iritis developed in the right eye, he removed his tonsils, which were infected, as a preparation for a needling operation of the membrane of the lens, considering it important to remove such foci of infection in advance. This case illustrates the importance of eliminating foci of infection before doing surgery of the eye. It is unusual on account of the injury to both eyes.

Discussion. — Dr. Dean. In such cases, the lens capsule is easily torn and drags on the ciliary body. The iris becomes adherent to the capsule, which brings in the element of danger in case of a needling operation. Atropin should be used before needling.

Dr. Lemere. In this case, there was a question as to whether sympathetic ophthalmia was present or iritis, and the possibility of removing the other eye was considered. It was decided that the condition was iritis due to foci of infection. Even in cases of sympathetic ophthalmia it is important to inquire into foci of infecton.

Dr. Potts asked why evisceration was not performed on the poor eye, which would have avoided the danger of sympathetic ophthalmia.

Dr. Banister. Evisceration was refused by the patient's friends as there was still light perception in the eye, altho the danger of keeping the eye was explained. There has never been any inflammation or irritation in the left eye.

Mooren's Ulcer.

Dr. J. M. Patton reported the case of Mr. E. J. H., who consulted him April 27, 1920, with a history of having gotten a cinder in his *left eye* the previous night. Vision, right eye 20/40 —1, left eye 20/200. There was a smooth looking ulcer just inside of left limbus. There was little irritation. May 3, 1920, very slight increase in the size of the ulcer, involving about 1/2 the thickness of the cornea. Conjunctiva at the margin was slightly thickened and a little more red.

May 18, 1920, the left eye was about the same, but the *right eye* began to trouble him a few days before. Now some ulceration, without infiltration, extended from 7:30 to 4:30 on the right cornea. Some undermining of conjunctiva. Left eye seems slightly improved in symptoms but ulcer about the same in size. Conjunctiva cut back from limbus about 1/8 of an inch, and area thoroly cauterized with trichloracetic acid. Examination of nose and throat practically negative. X-ray shows one pathologic retained dental root. 6-10-20 ulcers at outer side of cornea apparently healed. Left eye shows ulcer 1/32 inch in diameter at inner margin of cornea. Eye quieted down under treatment.

9-9-20 there was no staining anywhere. 10-27-20 right and left both stain slightly. 12-28-20 right eye seemed quiet. Left slightly progressive. 2-10-21 right eye very slightly active. Left eye cornea all gone except slight hazy center. Left eye progressed steadily until the center was destroyed. All the cornea was involved. Very slight progress in right. Right eye about same as at present for last two months. There may be very slight activity at upper inner portion of right limbus.

Previous cases of Mooren's ulcer in our experience were cured by deep cauterization with nitric acid. In this case, the following measures were employed. The actual cautery, excision of the conjunctiva around the ulcer, thermophore, iodin, delimiting keratotomy were used in the right eye without avail until the vision was very much reduced. In the left eye, the advance seemed to be stopped under present treatment of applications of weak silver nitrat to the lids, and diluted tricholoracetic acid to the active portions of the ulcer. Radium was tried but not the X-ray.

Rupture of the Choroid.

DR. L. G. HOWARD stated: C. C. C. came in July, 1921, complaining of loss of vision in right eye. The vision in the right eye had been somewhat impaired, following a traumatism from a sling shot at the age of fourteen years, but was still serviceable, up until two weeks ago. Two weeks ago, patient was struck in right eye by some unknown object which, however, did not bruise, cut or contuse the lid or eyeball externally. He then experienced sudden and almost complete loss of vision in that eye. He could still see objects but very indistinctly. Condition has not improved since then. Has occasional mild pain in eye but not severe. Sees better at night. Strong light dazzles the right eye. Family and past medical history negative. Admits ordinary diseases of childhood. Denies venereal disease. July, 1921. Pupil 6 mm. Does not react. Cornea clear. Lenticular opacity. Fundus not seen distinctly because of vitreous haziness. O. D. V. cannot count fingers. No central vision.

December, 1921. O. D. V. counts fingers at three meters. O. S. V. 20/20. Pupil fixed, 6 mm. Tension normal. Opacity in lens. Vitreous clear. Choroidal tear thru macula.

Discussion.—DR. DEAN saw the case when it first came in. It was never decided just what caused the injury in this case. He thinks it was possibly a bird flying against the eye. The sudden onset of blindness was probably due to haze in the vitreous. There was no evidence of intraocular hemorrhage.

DR. S. R. GIFFORD,
Secretary.

ST. LOUIS OPHTHALMIC SOCIETY.

March 24th, 1922.

DR. F. E. WOODRUFF, Presiding.

Eyes of Military Recruits.

DR. J. A. FLURY read a paper on the Eye Findings in 45,000 Men Entering Military Service at Camp Lee, which is not available for publication.

Neuropathic Keratitis with Special Relationship to Sinuses.

DR. J. W. CHARLES dwelt upon the theory that dendritic keratitis is a terminal nerve lesion and reported a case which seemed to be caused by ethmoidal disease. This is published in full. See p. 703.

Discussion.—DR. W. A. SHOEMAKER said: The case to which Dr. Charles has referred is that of a man aged about 40, who consulted me Jan., 1921, with the following history: For the last three days both eyes had been inflamed. He has a good deal of secretion in the mornings and more or less during the day. Examination revealed a severe staphylococcus conjunctivitis. For use at home I gave him a solution of zinc sulphat.

Jan. 30th the left eye began to water, pain and feel rough. Examination revealed a small spot of superficial keratitis, which stained with fluorescein. Feb. 1st, there was an extension downward of the process; the cornea

was anesthetic, and I realized that I had a neuropathic keratitis to deal with, and proceeded to look for the cause. Teeth and tonsils were found to be normal. Blood tests negative, with the exception of hemoglobin, which was 65. Metabolism 99.1.

Patient had had, for years, a tuberculous left kidney, with a sinus that discharged more or less; but otherwise seemed in good health. The corneal inflammation was not looked upon as tubercular.

The rhinologist reported a bilateral suppurative ethmo-sphenoiditis, for which he had been giving him conservative treatment for some months. As the eye was not improving under treatment, I advised a radical operation on both ethmoids and sphenoids. Two days after the operation the eyes began to improve, and by Feb. 15th, were practically well.

Adler's Pencil for Detection of Color Blindness.

DR. J. W. CHARLES showed how a patient was discovered in such inconsistent answers, in matching ninety-eight shades of colors in the Adler test, that either malingering or hysteria was certain; also the easily recorded and demonstrable results of the test.

Case of Hypothyroidism.

DR. J. W. CHARLES reported the case of a woman, 53 years old, who consulted him in 1918, with a vitreous hemorrhage in one eye and papill-edema with a marked strapping of vessels in the other. She was about five feet tall, and weighed 270 pounds. Her blood pressure was 260/140; there was great dyspnea on slight exertion; the heart was greatly enlarged with myocarditis; the pulse was 90; the urine contained 1/10% albumin and many hyalin and granular casts. She was put to bed and given thyroid. Upon her second visit in the fall of 1921, the patient weighed only 170 pounds, her heart and kidneys seemed normal. She is now doing all of her house work and taking care of a husband with heart disease. The appearance of the fundus of her good eye is very much better in every respect, the vision being 23/19.

The sequence in this case was undoubtedly hypothyroidism, obesity, strain on heart and bloodvessels, high blood pressure with its consequences (eye signs, and temporary damage to the kidneys), with complete relief by means of rest and thyroid feeding.

J. W. CHARLES,
Editor.

WASHINGTON INTERNATIONAL CONGRESS.

(*Continued from p. 674*)

Wednesday, April 27th, 1922.

Endophthalmitis Phacoanaphylactica.

DR. F. H. VERHOEFF, and DR. A. N. LEMOINE, Boston, Mass. Uhlenhuth in 1903 showed that rabbits could be immunized by repeated intravenous injections of ox lens protein, so that the blood would give the precipitin reaction with lens protein from other animals, but that these immunized animals failed to give the reaction with ox serum. In other words, reaction was tissue specific and not species specific. In 1909 Uhlenhuth and Haendel showed that guinea pigs could even be sensitized to their own lens protein. These results have since been verified by other observers.

It is well known that after injuries to the lens, in some cases inflammatory reaction follows, while in others no such reaction takes place. Some have maintained this inflammatory reaction was always due to infection, others have regarded it as the result of irritation due to lens matter. The latter view was apparently first brought forward by Lagrange and Lacoste, in 1911, who reported eight cases in a series of one hundred cataract extractions. Schirmer had observed cases presenting the same clinical picture, in which he had found the aqueous sterile, but which he did not explain on the basis of irritation from lens matter.

More recently the view that lens matter may cause intraocular inflam-

mation has been elaborated by Straub, who has reported the clinical and microscopic findings in a number of cases of such inflammation which he has termed "Endophthalmia Phakogenetica." He did not consider the possibility that some individuals are more sensitive to lens protein than others, but regarded the inflammation as due to the special toxicity on the part of the lens, and maintained that toxicity increased with age. He did, however, attempt to immunize one patient with such an inflammatory condition by subcutaneous injections of lens protein.

It occurred to one of us that inflammatory reaction following injury to the lens in certain individuals might depend upon hypersensitiveness to lens protein, acquired or congenital in these individuals, and its absence to the lack of such hypersensitiveness. We have endeavored to test this hypothesis by clinical and pathologic observations and by animal experimentation.

To ascertain whether or not individuals are hypersensitive to lens protein, we have employed the dermal and intradermal tests commonly used for determining sensitiveness to foreign proteins. In all cases pig lenses were used for the tests, and in some of them in addition human lenses obtained at cataract operations, and ox lenses. The lenses were obtained under aseptic precautions and, after removing their capsules, dried in the air for twenty-four to forty-eight hours, and ground to a powder in a mortar with a pestle.

The dermal tests were made by scarifying the skin of the forearm with a v. Pirquet scarifier until serum exuded without blood, and then placing the lens powder on the scarified area and keeping it moist with normal salt solution for about twenty minutes. Controls were made with salt solution only. Positive reactions became observable usually in 15 to 60 minutes, and consisted in slight hyperemia and elevation of the area. One patient had a very irritable skin, so that the control area also showed considerable reaction, but the area treated with lens protein showed so much greater reaction that there was no doubt that the test was positive.

In the intradermal test we used a 10% solution by weight, of fresh lens in normal salt solution, to which 0.5% phenol was added, 0.04 cc. being injected between the layers of the skin. For the control, normal saline solution containing 0.5% phenol was used. A positive reaction consisted in elevation of the area and hyperemia around it. This was usually not definite in less than two hours, and sometimes not until about twenty-four hours. This test proved to be the more satisfactory of the two, since it was always positive when the dermal test was positive, and definitely positive when the latter was slightly so. In some of our more recent cases, we have used three different dilutions in making the intradermal tests.

By means of these tests we have attempted, first, to ascertain whether patients who have had intraocular inflammation apparently due to rupture of the lens capsule are actually sensitive to lens protein. Naturally, only twelve such patients were available to us for this purpose, but fortunately these few were exceptionally suitable. Following are the cases of this series, twelve in number, in which these tests were made:

Case 1. Contusion of the right eye with rupture of the lens capsule followed by iridocyclitis. Enucleation and microscopic examination of right eye. Later, iritis and glaucoma in cataractous left eye. Iridectomy. Cataract extraction. Rupture of the lens capsule found at operation. Dermal and intradermal tests with lens protein positive. Sections stained by Gram's method show no bacteria within the globe.

Case 2. Spontaneous (?) rupture of lens capsule. Marked iridocyclitis. Enucleation. Microscopic examination of eye. Dermal and intradermal tests with lens protein, positive.

Case 3. Spontaneous rupture of capsule of cataractous lens. Marked iritis with Descemetitis and hypopyon. Enucleation. Microscopic examination of

eye. Dermal and intradermal tests with lens protein, positive.

CASE 4. Perforating wound of cornea, iris, and lens. Removal of foreign body by magnet. Iridocyclitis. Enucleation. Microscopic examination of eye. Intradermal test with lens protein, positive.

CASE 5. Extraction of mature senile cataract, followed by iritis and glaucoma. Enucleation. Microscopic examination of eye. Intradermal tests with lens protein, positive.

CASE 6. Combined extraction of immature cataract, with early discission followed by severe iritis and attacks of increased tension. Dermal tests with lens protein positive.

CASE 7. Combined cataract extraction with considerable retention of cortical matter, followed by severe iritis, descemetitis, and infiltration of the cornea. Dermal and intradermal tests with lens protein, positive.

CASE 8. Extraction mature senile cataract by capsulotomy method with retention of cortical matter within capsule. Moderate iritis. Dermal tests with lens protein, positive.

CASE 9. Old injury of left eye with iritis probably due to lens matter. Ten years later, cataract extraction by capsulotomy method right eye, followed by iritis. Later, discission, right eye, followed by iritis. Intradermal test with lens protein, positive.

CASE 10. Senile immature cataract. Intracapsular extraction with rupture of capsule and retention of some lens matter in anterior chamber, followed by iritis. Intradermal test with lens protein, positive.

CASE 11. Immature cataract. Attempted intracapsular extraction. Rupture of capsule and retention of cortical matter. Chronic iridocyclitis and complete occlusion of pupil. Intradermal test with lens protein, positive.

CASE 12. Perforating wound cornea. Traumatic cataract partly removed by linear extraction. Iridocyclitis. Lens matter removed by irrigation. Rapid recovery. Intradermal tests with lens protein, positive.

Attempting to ascertain the percentage of individuals in general who are hypersensitive to lens protein, we have made dermal or intradermal tests in 50 cases of various eye conditions. These cases were unselected so far as concerned the existence or nonexistence of inflammatory reaction dependent upon injury to the lens.

The ages were: under 20 years, 9 cases; 20 to 40 years, 9 cases; 40 to 60 years, 8 cases; over 60 years, 24 cases. There were 26 males and 24 females.

The tests were definitely positive in only four of the fifty cases: one was a case of interstitial keratitis in a female aged 13 years; one a case of mature senile cataract in a female aged 64; and two were cases of immature cataract operated upon by the intracapsular method, in which the ages were 46 and 64 years. Intraocular inflammation occurred in the two cataract cases, cases 8 and 10 described above, in which lens matter was left in the eye at operation, and not in the other cataract case in which the lens was removed with its capsule intact.

The important question whether patients who fail to show intraocular reaction following injury to the lens are insensitive to lens protein is answered in the affirmative by the foregoing series of cases, since in the 30 cases of perforation or rupture of the lens capsule inflammatory reaction occurred only in the two cases in which there was a positive skin reaction to lens protein.

To determine whether or not the histologic changes following rupture of the lens capsule in sensitized individuals are such as to indicate that they are due solely to lens matter, we have studied these changes in the five positive cases described above, in which pathologic examinations were made, and compared them with the changes found in sections of all eyes in the pathologic collection of this laboratory which showed injury to the lens. We find that the injured lens in individuals hypersensitive to lens protein, attracts chiefly two types of cells, namely, pus cells and endothelial phagocytes. The pus cells infiltrated the lens substance, and when lens matter is present in the anterior chamber, collect here also. These cells after a time undergo necrosis, especially when pres-

ent in abundance. Eosinophiles generally are inconspicuous but are sometimes abundant. The endothelial phagocytes likewise invade the lens substance and may be seen in the act of phagocyting it. Sometimes they form thick syncytical masses bordering upon the lens substance, and often form giant cells of the Langhan's type. Endothelial phagocytes are also sometimes abundant in the anterior chamber, and here are often loaded with pus cells and chromatin fragments.

The iris is infiltrated with lymphocytes and plasma cells, the latter greatly predominating, while attached to its surface there are large and small lymphocytes and pus cells. Similar cells also are collected upon the posterior surface of the cornea, where they tend to occur in clumps. The collection of cells on the back of the cornea may be so massive, that it causes proliferation of the endothelium and extensive formation of fibrous tissue here (Case 3). Where the process is especially active, there may be a moderate amount of fibrin and blood in the anterior chamber (Case 3).

From the pupillary margin of the iris, fibroblasts and blood capillaries extend over and invade the injured lens and close it off, so that ultimately further egress of lens material to the anterior chamber is cut off by fibrous membrane. There is more or less proliferation also of the capsular epithelium, which after a time leads to the formation of anterior capsular cataract. The capsular epithelium in addition seems to give rise to a few free ameboid cells, which phagocyte the lens material, but these cells are so similar to the endothelial phagocytes that it is difficult to distinguish them from the latter.

In the case in which adhesion of the iris to the lens prevented lens material from reaching the vitreous chamber, the posterior part of the eye shows little reaction. When there is access of lens matter to the vitreous, the ciliary body shows more or less reaction. The interstitial infiltration, however, is relatively slight, and the infiltrating cells consist almost exclusively of plasma cells. From the epithelial surface there is an exudation of plasma cells and lymphocytes. The ciliary epithelium shows proliferative changes and may give off many free epithelial cells into the vitreous; in cases 2 and 4 dense cyclitic membranes have been formed. The choroid shows no involvement except anteriorly, where the infiltration of the ciliary body may continue into it for a short distance. The retina shows perivascular infiltration with lymphocytes, and more or less edema around the disc and in the macular region. In Case 4 there are nodular collections of lymphocytes, plasma cells, and large mononuclear cells on the inner surface of the retina and, in places, localized foci of neuroglia proliferation beneath the surface. The optic disc shows perivascular infiltration with lymphoid cells, slight edema, and in cases 1, 2, and 4, neuroglia proliferation along its surface.

In the pathologic collection of the Infirmary, covering a period of twenty-one years, we are able to find sections from 25 cases of injury to the lens in addition to those already described, which show changes which we regard as characteristic of phacoanaphylactic endophthalmitis. We also find sections from ten cases in which we are unable to determine whether or not the inflammatory reaction was due to anaphylaxis. In each of these cases the lens was infiltrated solely with endothelial phagocytes, and in one there was a tubercle on the anterior surface of the iris, due to lens matter which had been surrounded by endothelial leucocytes and giant cells. Whether or not in these cases the inflammation was anaphylactic in nature it is difficult to say, but the clinical fact that injury to the lens is often followed by no inflammatory reaction, suggests, that in some of these cases the reaction may have been the result of low grade sensitiveness to lens protein. As a matter of fact, three of the patients returned later and each gave a doubtful intradermal reaction with lens protein. Moreover, in the same pathologic collection we are able to find sections from five cases in which injury to the lens had caused no reaction. That so

few specimens of this kind can be found is obviously explained by the fact that only under exceptional circumstances are such eyes removed.

ANIMAL EXPERIMENTS.

In these experiments our purpose was to ascertain the effects produced by discission of the lens capsule in normal animals and in animals sensitized to lens protein. Guinea pigs and rabbits were employed. Ether narcosis was employed in all experiments except three in which cocain was instilled before operation. All enucleated eyes were fixed in Zenker's fluid and embedded in celloidin. Sections were stained in hematoxylin and eosin, and by Verhoeff's modified Gram stain for bacteria. No bacteria were found except in the right eye of Exper. 1, which was infected with streptococci. In connection with the Gram stain it may be well to state here that the cataractous lens, after fixation, often in places appears to have undergone transformation into fine granules, some of which are basophilic and stain deeply by the Gram method. Such granules sometimes occur in pus cells, possibly due to precipitation of lens material within the latter, and often closely resemble large cocci.

In our preliminary experiments 3/8 gm. of pig lens was injected subcutaneously into each of four guinea pigs. All of them died within three weeks, showing that too large a dose had been used. We then reduced the dose to 1/24 gm. per 100 gm. of body weight and had no further lethal effects. Intradermal skin tests were made at the end of four weeks to ascertain whether or not the animals were hypersensitive, and all of the injected animals gave positive tests. One of the control guinea pigs tested in the same way gave a negative reaction. Seventeen days later a discission was performed upon his right lens. This gave rise to so much reaction that we suspected that he had been sensitized by the subcutaneous test previously made. On making another intradermal test we found that this was actually the case, so that we desisted from making these tests in our control experiments.

Discissions of the lenses were made in the eight eyes of four rabbits. In two of the animals the discissions were made 21 days after subcutaneous injection of 1/24 gm. of fresh pig lens protein per 100 gm. of body weight. The eye of one control animal was infected and is therefore excluded from consideration. Clinically, the intraocular reactions were definitely greater in the treated animals than in the controls, but in the latter were greater than in control guinea pigs. Histologically, the reactions were also more marked in the injected animals, than in the controls, but did not show the characteristic features seen in hypersensitive guinea pigs and human individuals. Possibly sensitization by repeated small doses of lens protein might give more characteristic results.

The foregoing clinical observations, tests, and microscopic examinations, prove conclusively that certain individuals are hypersensitive to lens protein, and that when in such individuals rupture of the lens capsule takes place thru injury or operation or spontaneously, a characteristic inflammatory reaction results. This reaction may properly be termed endophthalmitis phacoanaphylactica.* Whether or not hypersensitiveness to lens protein is congenital or acquired, and if the latter, how it is acquired, we have at present insufficient data to determine. While experimentally it is possible to sensitize an animal to its own lens protein, the evidence is against the possibility that injury to the lens of one eye may sensitize an individual so that a local anaphylactic reaction will take place if the other lens is injured. The clinical fact, that in cases of congenital cataract discission of the cataract in the second eye ordinarily causes no greater reaction than that following discission of the cataract in the first eye, seems to be sufficiently conclusive on this point. Possibly, in these cases, absorption of lens matter slowly and continuously over a long period of time, if it has any effect, may cause

*Endophthalmitis phacoallergica may be a better term, but probably it would not be generally understood.

immunity rather than hypersensitiveness.

Our experiments upon animals seem to show that a guinea pig may be sensitized to lens protein so that a free discission of its lens capsule will be followed by a severe and characteristic intraocular reaction. That the dosage of lens protein employed was sufficient to sensitize the animals is shown by the skin tests and also by Exp. 12, in which a second subcutaneous injection, made 20 days after the first, caused marked general symptoms of anaphylaxis. Histologically, the ocular reaction differs from that in human individuals only in the extent to which the cornea is affected, the latter in the case of the guinea pigs showing marked haziness and vascularization. In Experiments 2 and 5, the cornea became almost completely vascularized. It is to be noted, however, that in one of our clinical cases, Case 1, the cornea became almost completely vascularized. In our control experiments, the intraocular reaction following discission of the lens was not only slight, but differed in character from that seen in a sensitized animal.

As Longcope has recently pointed out in human individuals, the state of hypersensitiveness to foreign proteins shows certain differences from that produced experimentally in animals, and he raises the question whether it is based upon the same mechanism. In this connection, he calls attention to the familiar occurrence of hypersensitiveness to certain proteins in human individuals, which suggests that inheritance is an important factor, and to the rarity with which specific antibodies are found in the serum of these individuals. Whether or not there is an important difference between the mechanisms of natural and artificially produced anaphylaxis, the clinical effects seem to be essentially the same, and our experiments on guinea pigs seem to show, that in animals sensitized to lens protein, the intraocular reaction produced by injury to the lens is microscopically identical with that in human individuals. It has been frequently noted that immune and anaphylactic reactions of rabbits are markedly different from those of guinea pigs, and Zinsser has recently pointed out the close similarity of such reactions in guinea pigs and human individuals. The former fact no doubt explains our failure to produce typical phacoanaphylactic endophthalmitis in rabbits, and the latter fact is confirmed and amplified by the positive results of our experiments on guinea pigs.

The clinical picture of phacoanaphylactic endophthalmitis is fairly characteristic, especially in marked cases. In the beginning there is simple iritis with posterior synechia. From the pupillary margin a vascularized membrane extends over the injured lens. At the same time the lens matter becomes infiltrated, until it presents an opaque finely granular appearance. At this stage, precipitates may be found on the posterior surface of the cornea. These are apt to be unusually large, and white in appearance. Sometimes, a small hypopyon is formed. If the process continues, the cornea becomes cloudy, and progressively vascularized. The intraocular tension is apt to be increased. Pain and congestion of the eye vary with the activity of the process, and are sometimes relatively slight. To make the diagnosis certain, dermal and intradermal tests with lens protein should, of course, be employed in all cases.

Our observations concerning the histology of phacoanaphylactic endophthalmitis are sufficiently summarized above, but we may point out here that the invasion of the lens substance by pus cells seems to be especially characteristic, particularly as regards the relatively normal portion. In other words, in hypersensitive individuals, exposed lens matter is pyogenic. We should, in fact, hesitate to make a diagnosis of phacoanaphylactic inflammation histologically in the absence of any purulent infiltration of the lens.

The severity of the intraocular reaction depends largely on the extent of the gap in the lens capsule, and upon the amount of lens substance that is extruded into the anterior chamber or vitreous. When the gap in the capsule

is so situated that access of lens matter to the vitreous is early cut off by adhesion of the iris to the lens, the reaction is confined chiefly to the anterior part of the eye, notably the iris. When the lens matter accumulates in the vitreous chamber, cyclitis results, and may lead to the formation of dense cyclitic membranes. In this event, also, the retina and optic disc may be markedly affected. When the defect in the lens capsule is covered over by organized tissue derived from the iris, egress of lens material is prevented and the inflammatory reaction then takes on a chronic and probably intermittent character, and may persist for a year or more.

The microscopic examination in Case 2 shows that there had been an old rupture (traumatic?) of the lens capsule, and old severe iridocyclitis. As a result of the latter, the lens had been walled off and invaded by dense connective tissue. The lens cortex had become completely cataractous and in many places calcified, but the nucleus had caused a marked inflammatory reaction, as shown by the fact that it was surrounded by endothelial phagocytes and giant cells, and deeply invaded by an abundance of pus cells. Whether or not the original iridocyclitis represented a reaction to lens matter it is, of course, impossible to say, but there can be no doubt that the recent reaction was of this nature. This case seems to show that reaction to lens matter may recur at long intervals.

From the foregoing observations, it will be seen that phacoanaphylactic endophthalmitis both clinically and histologically produces a picture similar to, if not identical with, that of the socalled serous traumatic iridocyclitis. We are, however, not yet prepared to say that the latter condition is always phacoanaphylactic in origin.

After cataract extraction in hypersensitive individuals, the severity of the reaction depends upon the amount of lens matter left in the eye, and upon the extent to which it is protected by the collapsed capsule. In some cases the reaction may subside while a large amount of lens substance still remains closed off within the capsule. A discission of the lens capsule will then lead to a renewed inflammatory reaction.

It is probable that the severity of phacoanaphylactic endophthalmitis also may partly depend upon the degree of sensitization to lens protein. Our clinical data, however, are insufficient to establish this as a fact, but it is indicated by the results of the histologic examinations, as noted above.

Judging by our skin tests, individuals hypersensitive to lens protein are more sensitive to normal lens matter (immature cataract) than they are to the cortex of a fully mature cataract, and our histologic findings seem to indicate, that in hypersensitive individuals normal lens matter is more pyogenic than is cataractous lens matter.

Our tests made upon human subjects afford interesting confirmation of the facts, previously demonstrated in other ways by animal experimentation, that lens protein is not species specific, and that an individual may be hypersensitive to the protein of his own lens. For we found that patients hypersensitive to pig lens were also hypersensitive to ox lens and human lens; and that the one individual hypersensitive to pig lens who was tested with protein from her own immature cataract, gave a positive reaction to the latter.

In cases of hypermature cataract, the fluid cortex is said to be especially irritating to the eye. We have had opportunity to examine microscopically two eyes with Morgagnian cataracts, in which there had been rupture of the lens capsule without history of injury. The changes in each eye differed only in degree. In neither eye was the nucleus infiltrated with pus cells. The cellular exudate which came chiefly from the iris, consisted exclusively of endothelial cells, except in the more marked case, in which there was an insignificant collection of pus cells at one place on the iris. The endothelial phagocytes were collected in abundance on the anterior surface of the iris and on the posterior surface of the cornea. The iris was free from infil-

tration, lymphocytes and plasma cells, and in the more marked case had undergone almost complete necrosis. In this case there was also hypopyon of 1.5 mm., composed entirely of endothelial phagocytes, mixed with a slight amount of blood. In the other case, also, there was a slight amount of blood in the anterior chamber. These findings are markedly different from those in our cases known to be hypersensitive to lens protein, as well as from those in our series of untested cases in which the cataract was not hypermature, and strongly indicated that the irritation to the eye produced by Morgagnian fluid is not a reaction of anaphylaxis but is analogous to that produced by any necrotic tissue. If the patient should happen to be sensitive to lens protein, there would, of course, be superimposed a phacoanaphylactic reaction.

TREATMENT.

The treatment of phacoanaphylactic endophthalmitis should consist in the use of atropin to dilate the pupil, and of hot fomentations to control the pain. If the patient proves to be sensitive to atropin, hyoscin may be employed instead. If only a small amount of lens matter remains in the eye, or the latter is well protected by the capsule, no other treatment may be needed. If the condition does not subside within a reasonable time, a linear extraction should be performed and the lens matter thoroly removed by irrigation. This procedure should also be employed in cases in which the intraocular pressure becomes greatly elevated.

In cases which have reached a chronic stage owing to the lens matter having been closed off by fibrous tissue, the process could, perhaps, be checked by immunizing the patient by means of repeated injections of lens protein. Probably, however, linear extraction would be preferable in these cases also.

In connection with prophylaxis, tests with lens protein preceding operation would seem to be of considerable value, especially in cases of congenital and immature senile cataract. In cases of fully mature senile cataract, or of sclerosed lenses, a positive test would emphsize the importance of removing all cortical matter possible. In cases of congenital cataract, it would indicate the employment of free discission followed by early linear extraction, or, possibly, an attempt to immunize the patient to lens protein before operation.

In cases of immature senile cataracts, a positive test would indicate the advisability of postponing operation, if possible, until the cataracts had fully matured. When this would entail too much loss of time, and the patient is over 50 years of age, an intracapsular operation should be performed upon one eye, and the cataract in the other allowed to become mature.

In the case of a patient under 50 years of age with immature cataract, it might be well, owing to the danger of rupture of the capsule, to attempt to produce immunity to lens protein before operation. After such immunity had been established, it might be possible in such a case to employ discission of the cataract, followed by simple linear extraction. (Since this was written we have succeeded in immunizing such a patient, judging by the fact that he now gives a negative skin reaction, whereas he gave an intensely positive test before treatment with lens protein. The details of this case will be reported later. (See p. 700.)

SUMMARY AND CONCLUSIONS.

In a series of twelve cases of rupture of the lens capsule, traumatic, operative, or spontaneous, in which there occurred intraocular inflammation apparently due to lens matter, a positive skin reaction to lens protein was obtained in every case.

Microscopic examination of five eyes from these cases showed a characteristic histologic picture in each.

In a series of twenty-eight cases of rupture of the lens capsule, in which there occurred no intraocular inflammation, a negative skin reaction to lens protein was obtained in every case.

In a series of fifty unselected cases of various kinds, there was a positive skin reaction to lens protein in four cases.

An individual hypersensitive to lens protein of the ox or pig is also hypersensitive to the protein of his own lens.

Experiments on guinea pigs seem to show, that free discission of the lens capsule of an animal sensitized to lens protein causes a marked intraocular reaction with characteristic histologic changes.

Inflammation resulting from lens matter in the eyes of individuals hypersensitive to lens protein, we have termed phacoanaphylactic endophthalmitis.

Intraocular inflammation resulting from rupture of a Morgagnian cataract is not usually phacoanaphylactic in nature.

All patients with congenital or immature cataracts should be tested with lens protein before operation.

In the case of a patient with cataracts in both eyes, and over fifty years of age, who is found hypersensitive to lens protein, the cataract in one eye should be removed in capsule, or operation postponed until it is fully mature. If the patient is under this age, an attempt should be made to immunize the patient before operation.

The best treatment for severe phacoanaphylactic endophthalmitis is removal of the lens matter by operation.

Serum and Vaccine Treatment for the Prevention and Cure of Cataract.

Dr. A. Edward Davis, New York City. In 1902 and 1903, under the direction of the late Dr. Justin DeLisle, sera were obtained from rabbits immunized against human cataractous lenses, and rabbits immunized against normal guinea pig lenses.

In these experiments an attempt was made to dissolve or absorb the guinea pig cataractous lens, both *in vitro* and *in vivo* with antilens serum, and in each instance only a partial success was obtained. With the human cataractous lens, the attempt to dissolve the lens was made only *in vitro*.

Most of the cytolysins are *species* specific; that is, they react only on the species from which the tissue or antigen is obtained. A few of the cytolysins are *organ* specific to a greater or less degree, e. g. spermatozoa, the testicle, the ovary, and of the tissues of the eye, the crystalline lens and the uveal pigment. Very recently Hektoen has called attention to the specific precipitin reaction of the lens, and cites Uhlenhuth, who first called attention to the fact that the lens of different species give the same immune reactions, that is, that it is *organ*-specific and not species-specific. Hektoen (loc. cit.), after numerous experiments with lens antigens of different animals, arrived at the conclusion that the *organ*-specificness of the lens holds good thruout, and that the lens does not appear to contain any *species*-specific antigens; hence the lens protein may be regarded as chemically distinct, and as identical in diverse species.

Guyer and Smith call attention to the fact that all cytolytic sera, so far studied, have been found to be more or less hemolytic in action. Like the hemolysins, they are also specific in action on the special tissue used as the antigen in the sensitizing process. However, they are not absolutely specific in action, as homologous tissues may be affected, to a slight extent, e. g., the vitreous when lens cells are used as antigen.

Bearing in mind all the limitations of specificity of action of the different cytolytic sera so far developed, and the dangers that may be incurred by their lytic action on the cells of the homologous tissues, other than the tissue cells furnishing the antigen, the experiments on the human subject (related in detail below) were proceeded with, on the basis that the main action would be on the tissue cells used as antigen, especially on organ specific antigens.

There is one real danger, and that is anaphylactic shock, more or less severe in character, which at times follows the intravenous injection of the lens antiserum and lens vaccines.

Chemical Composition of the Crystalline Lens. The greater part of the solids of the crystalline lens consists of proteins. The actual percentage of the various solids in beef lens is as follows:

Protein	35.00
Fat and Lipin	0.75
Salts	0.75
Water	63.50

The protein constituents have been divided by Morner into two parts, the albumoids and the crystallin. Albumoid is found in the lens fibers and is insoluble in water and in salt solution. It dissolves readily in dilute acids or alkalies. The crystallin (A and B crystallin) are globulins, and are soluble in water and in salt solution.

Jess has shown, that in the senile cataract of oxen the crystallins are transformed in part to albumoid. According to Hammarsten, the relation between albumoid and crystallins is changed with increasing age, the albumoid increasing, the crystallins decreasing. In normal lens, the relation of the crystallins to the albumoid changes correspondingly from 82:18 in youth to 41:59 in old age; in senile cataract the relation can be changed to 25:75. The other constituents of the lens remain unchanged.

Experiments. The first experiments were concerned with the effect of intravenous injections of antilens serum on patients suffering with cataract. The antilens serum was prepared in three different ways:

(1) By immunizing rabbits against normal guinea pig lenses. (Anti-guinea-pig-lens rabbit serum.)

(2) By immunizing rabbits against human cataract lenses. (Anti-human-cataract-lens rabbit serum.)

(3) By immunizing a sheep against normal beef lenses. (Anti-beef-lens sheep serum.)

In view of the great similarity in chemical composition of cataract to normal lens, there seemed to be no reason for confining the study to the effect of anticataract lens serum. The comparative scarcity of cataracts would have made such a study impracticable. Hence the use of sera from animals immunized with normal guinea pig or beef lenses.

Later on, the unpleasant effects of the serum led to a study of the effects of lens antigen when injected directly into patients with cataracts. This also appeared more rational on theoretic grounds, as more lens antibody was probably made available by active immunization than by attempts to confer a passive immunity with serum.

1. *Preparation of anti-guinea-pig-lens rabbit serum.* Fresh guinea pig lenses were removed under sterile precautions, ground in a mortar and suspended in normal salt solution in the proportion of one lens to each cu. cm. of salt solution. The suspension was then centrifuged to remove coarse particles, and the supernatant opalescent fluid preserved in vaccine bottles. To insure sterility, a few drops of chloroform were added to each bottle, and the preparation stored in the refrigerator.

Two large rabbits were injected intravenously every day for six days with small doses of guinea pig lens extract. Ten days after last injection, they were killed by bleeding and the serum preserved.

2. *Preparation of anti-human-cataract-lens rabbit serum.* Human cataract lenses which had been recently removed at operation were dried over anhydrous calcium chlorid, then ground to a powder in a sterile mortar. The powder was then suspended in normal salt solution in the proportion of one lens to 2 c.c. of saline, the coarser particles removed by centrifuge, and the supernatant fluid decanted into sterile bottles. A few drops of chloroform were added for preservative.

Two large rabbits were injected intraperitoneally once a week for six weeks with 5 c.c. of the lens extract.

Two other rabbits were injected with cataract lens extract intravenously. The injections were given daily for seven days. Dosage: 0.5 to 1 c.c. of extract. These rabbits were bled to death and serum preserved on ice.

Other rabbits were also injected with cataract lens extract intravenously:

3. *Preparation of anti-beef-lens sheep serum.* Fresh beef lenses were removed under sterile precautions and dried in a vacuum oven at 35° C. The dried lenses were then pulverized in a sterile mortar and the powder preserved in a sterile glass bottle.

The lens extract was prepared as follows:

Powdered lens	10. gm.
Sodium carbonat	0.5 gm.
Sodium chlorid	0.85 gm
Distilled sterile water..	100. c.c.

The solution was centrifuged to remove coarse particles, and the opalescent extract preserved by the addition of a few drops of chloroform.

A sheep was injected intravenously every four to seven days with the beef lens extract. From time to time the sheep was bled and the serum preserved for further study, and for therapeutic inoculations.

The serum from a rabbit was tested for precipitins against cataract lens, after having received 12 intravenous injections of human cataract lens extract. Stronger solutions proved positive; those of 1:10,000 and weaker were negative.

REPORT OF CASES—These patients, 13 in number, were inmates of the State Hospital for the Insane, Central Islip, N. Y. All injections of serum and vaccine were generally administered intravenously.

(1) In these experiments both sera and vaccines have been used, and in some patients both the sera and vaccines at different periods of the treatment. Altho it was known that the lens antigen was organ-specific in its action, nevertheless, it was thought that lens antigen from the same species would possibly produce a more powerful serum than lens antigen from a foreign species. Accordingly at first only the human lens antigen was used. Subsequently, because of the difficulty in securing sufficient human lenses, beef lens antigen was used in the preparation of antilens sera. The reason for changing from antilens sera to lens vaccines, in the same patient, was twofold. The intravenous injection of serum, when increased up to 5 c.c. and sometimes much less quantity in female patients, caused marked anaphylactic shock; and it was thought perhaps that the *active* stimulation of lens antibodies in the patient by injections of vaccines, would have a more lytic or dissolving action than the *passive* treatment by means of the very small amount of lens antibodies contained in the serum injected.

It was found by actual experience, however, that the lens vaccines also produced shock, when given intravenously and carried up to as high as 5 c.c., or even less quantity. Because of this shock effect, which at times was quite alarming, both with the sera and vaccines when given intravenously, we finally decided to give all injections, sera and vaccines, subcutaneously. Since this method was adopted, no symptoms of shock have followed.

(2) *Source and strength of the sera*: Since the lens is organ-specific and not species-specific, the question of securing sufficient lens antigen to manufacture antilens serum has been greatly simplified, since beef, sheep, swine lenses can be had in any quantity; and sheep, cows or horses, even, can be used as the source of the sensitized serum. In our experience, instead of using human lenses as the antigen, and rabbits as the source of the sensitized serum, we used beef lenses as the antigen and a sheep as the source of the sensitized serum. This is a practical method, and if the treatment ultimately proves successful, there will be no lack of remedy with which to treat patients.

(3) *Standardization of the sera*: So far we have not been able to have a standardized serum, but trust to have this later. Guyer and Smith state that in their experiments, inasmuch as they had no visible way to tell when serum is adequately sensitized for use as a cytolysin beyond trying it out directly, a series of lens precipitin tests were made with various of the fowls (which they used as the source of sensitized serum) after the fifth and sixth injections of antigen, respectively, in order to be sure they were responding to the lens proteins. They do not claim a necessary connection between the precipitin and cytolysin reactions of the blood, but it is thought that if the lens had so sensitized the fowls, that precipitins were formed, one might infer that cytolysins had also been generated. It is possible, therefore, and feasible to test the animals (rabbits, sheep, etc.) we are now using as the source of the antilens sera, in the same manner to determine if the sera are strongly sensitized with cytolytic substances.

(4) *General reactions:* First to be considered is shock. Several of our

cases suffered more or less severely from shock, both with the sera and vaccines, at times even when small doses were administered intravenously. The whole surface of the body, within sixty seconds would turn intensely red, then after a few moments would become more or less livid; labored and irregular breathing with great dyspnea, rapid weak pulse, which at times was quite irregular, great restlessness, at first quickly followed by marked general weakness, and in the severe cases of shock there occasionally was involuntary movement of the bladder and bowels. Perhaps the most distressing symptom was that of impending suffocation. The blood pressure following shock varied; in most of the cases it was lowered; however, in others it was elevated. As regards temperature, unfortunately this was not taken in our cases, except in a few instances. In animals, usually, there is a marked drop in the temperature following shock, and Pfeiffer states that by this symptom alone the mildest anaphylactic reactions may be detected, even when other symptoms are not present.

The general effect of the prolonged administration of antilens sera and vaccines is that of anemia, more or less pronounced. In one of of our cases the patient became pale, lost weight and appeared to be "drying up," as one of the staff at the hospital remarked. This patient never suffered shock, or had any other ill effect from the injections, except that he gradually lost weight without any apparent cause, and for this reason alone the injections were discontinued.

A third general symptom that appeared in one case, was an extensive urticaria, manifesting itself as large wheals, an inch or more in diameter, elevated above the surrounding skin surface, which covered most of the body, lasted a few days, then disappeared. No other patient was similarly affected. All of the patients treated, except one or two, responded to the sensitization tests when a small amount of the serum or vaccine, with which they were being treated, was injected intradermally.

(5) *Local reactions:* How and why the antibodies contained in sentitized sera, or the antibodies produced by the injection of the vaccines directly into the animal, act selectively and specifically on the tissues used as antigen are still conjectural. All we know definitely is, that they have a more or less specific action, the sera acting passively and the vaccines actively.

Guyer and Smith (loc. cit.) in their extended experiments on pregnant rabbits and mice with fowl serum sensitized to rabbit lens and mice lens, respectively, have noted opacification and liquification of the lenses of the young, but never in the mothers, who were directly injected. In the case of one young mouse, the lens in one eye was rendered opaque, and in the other eye, the lens was liquified. In no instance were the lenses of the mothers affected. Their comment relative to this point is as follows: "In so far as the literature on cytolysins records positive results, it leads one to expect specific effects in the immediate animal injected. A possible explanation of the lack of effect on the mother may be that because of the meagre circulation of blood in the lenses of adults, the quantity of cytolytic serum which reaches a lens is insufficient to affect it."

On the lenses of the developing young *in utero,* as is well known, there is a vascular membrane, and the cytolytic substance can reach these lenses and have a much greater effect. Furthermore, such developing lenses are softer and have not the fibrous masses which obtain in older animals. Guyer anr Smith attribut the *liquefaction of lenses,* observed by them in the young of rabbits and guinea pigs, to a true cytolytic action of the sensitized serum used by them. Whether clouding and opacifying which occurred in other of the lenses should be regarded as the result of cytolysin or of a precipitin, they regard as problematic.

A further possible explanation of why cytolytic sera do not affect the lenses of adult animals or man powerfully, may be the lack of alexin or complement in the aqueous humor of the anterior

chamber of the eye. This fact would suggest one practical point in the attempt to absorb or liquify cataracts in the human animal, that is, during the period that the vaccines are being given, the eyeball should be massaged, or subconjunctival injections of some slightly irritating fluid be given—in fact any safe means employed that would induce an increased flow of the plasma and along with it leucocytes into the anterior chamber of the eye; because it is absolutely necessary to have complement or alexin present in conjunction with the antibodies of the sensitized serum, in order to obtain a lytic effect—that is, absorption or liquefaction of the lens.

(6) The local effects of sera and vaccines on the cataractous lenses, that is, as regards mature and immature cataracts, were exactly the opposite to what we had preconceived at the beginning of the treatments. We had supposed that the immature cataracts with the scattering or partial opacities would be most vastly affected. It proved to be exactly the contrary. The only two patients in whom we obtained partial liquefaction of the lenses, were those having mature, gray, senile cataracts, where a great part of the cortical layers were absorbed. The sera and vaccines seemed to have no liquefying effect on the spiculæ in the incipient cases.

(7) It may be asked, why should these insane patients blinded by cataracts be subjected to more or less risky treatments? For two reasons: first, many of these patients cannot be operated upon for the cataract because of their disturbed condition, the patient destroying the eye at the time of the operation, or subsequently, before the wound is healed, by his violent actions. No such risk to the eye is incurred when vaccines and immunized sera are given; second, when these antilens sera and lens vaccines are given subcutaneously or deep into the tissue, no more risk is incurred to the patient's general condition, than is now taken daily by injecting the various bacterial vaccines and sera—for instance, diphtheria antitoxin. The general condition of these insane patients is often greatly improved by the removal of cataracts; therefore, if we can devise a safe means for the absorption of their cataracts, even in the most disturbed cases, we will have accomplished a great advance in their treatment. Furthermore, the full consent of relatives or friends was obtained before these experiments were started.

(8) Twelve of these patients were bled on Dec. 24, 1921, and precipitin tests on their sera were made, which proved inconclusive.

Precipitin Tests on Sera of Patients Treated With Lens Antigen.

No. of Case	Dilution of Lens Antigen 1–10	Dilution of Serum 1–10	1–100	1–200
2		—	—	—
3		+	—	—
4		—	—	—
5		—	—	—
6		—	—	—
7		—	—	—
8		—	—	—
9		—	±	—
10		—	—	—
11		—	+	—
12		—	—	—
13		—	—	—

CONCLUSION. No definite conclusions can be drawn from so few cases as here reported. The partial results so far obtained would seem to indicate: First, that mature, senile cataracts (at least the cortical layers) may be absorbed or liquified; second, a possibility that immature cataracts may be retarded or entirely checked in their progress. The present paper is to be considered simply as a preliminary report, to be followed by further and more extended experiments.

Phacoerisis.

PROF. I. BARRAQUER, Barcelona, Spain. Daviel proposed the total extraction of cataract, but on account of its technical difficulties he resorted to cystotomy. The varied procedures that have been employed are conclusive evidence of the general desire to remove all soft cortical matter if possible. In spite of these modifications of the operation, and the complementary operations like preliminary iridectomy, ripening, etc., total extraction is the only rational way of removing cataract. It removes the cause

of postoperative inflammation but it introduces operative dangers. Being convinced that the best method would be one that pulled the lens out in its capsule, the first idea was to use forceps that would not tear the capsule. Later it was thought a small cup adapted to the anterior face of the crystalline should be able to seize it and break the zonule. Many variations of apparatus and of vacuum were tried before succeeding and removing entire the cataracts with a minimum number of ruptures of the capsule. Pulling on the zonular fibers must predispose complications in the ciliary region.

The first instrument was a pneumatic forceps to which the present one adds a cutter of the zonule. Frequent, small tugs are made by rapid, vibratory motions, so as to rupture the zonular fibers near the crystalline without having the force extend to the ciliary region. The vibrations should be adjusted to the hardness of the lens and the resistance of the zonule. The vacuum should be proportioned to the hardness of the lens, and the frequency of vibration to the elasticity of the zonule. My early statistics were impaired by chronic iridocyclitis due to inclusion in the corneal wound of zonular fibers, or to inclusion of angles of the coloboma of the iris. Such inflammation was rare without iridectomy. I therefore make a simple extraction, adding a small peripheral opening in the iris. The only instrument introduced in the eye is the erisiphake. Postinflammatory reactions are due to (1) cystotomy, numerous maneuvers and (2) remnants of degenerative crystalline and capsule. (3) Incarceration of capsule does not exist. Infections are very rare because the conditions that favor them are absent.

The technic is easy but requires attention to details indispensable for a good result. The patients are examined with the pupil dilated with euphthalmin, with the binocular microscope and slit lamp to ascertain the characteristics of the cataract, etc., in order to grade the vacuum and the number of vibrations per minute, as well as to learn the maturity of the cataract and the freedom of the eye from sepsis. The incision includes two-fifths of the corneal circumference with a conjunctival flap in which a suture may be placed. The erisiphake is introduced and applied on the anterior surface of the lens at the center of the pupil, its lower edge passing somewhat behind the iris; then the vacuum is produced and the zonular fibers broken. Then slowly rotate the lens, turning it so that its lower edge is turned up. Eserin ointment is used, that the miosis produced may prevent incarceration of the zonular fibers; and to prevent squeezing of the lids, paralysis of the orbicularis is advised.

By varying the vacuum and the frequency of vibrations, all kinds of cataract may be extracted from patients over 40 years of age, and also in some younger patients. I have operated on more than two thousand cases and the only accidents of my later statistics are:

1. Difficulty of making a peripheral iridectomy on account of dilatation of the pupil.

2. After incision, sometimes the pupil contracts so as to make difficult the proper placing of the cup. In case of seizing the iris between the cup and crystalline, after turning the lens suspend the vacuum so as to release the part and then catch the lens again.

3. Rupture of the capsule. (a) On taking hold of the cataract and employing too intense a vacuum. (b) In young patients a resisting zonula may be opened below. (c) On finishing the extraction the lip of the wound may break the capsule by pinching. The contents escape in the eye and the conjunctiva. Rupture has no inconveniences other than the conversion of total extraction into cystotomy. It is infrequent when one has had practice in the procedure.

(4) Loss of vitreous occurs only when undue pressure is made on the globe by the operator or patients. It is very rare with the induced temporary paralysis of the orbicularis.

Postoperative complications do not occur without some operative accident or error of the patient. Iritis may follow pinching of the iris. If the capsule has been broken, the complications are such as follow cystotomy. In vitreous prolapse, if it be cut off and the wound closed with a suture, the pupil becomes black, central and round, and only slight

opacities of the vitreous arise and disappear slowly. In restless patients or those who have a cough, or tend to vomit, or who receive a traumatism, a peripheral opening in the iris limits the effects to slight conjunctival reopening of the wound and hyphema, which disappears in 24 hours or less.

Study of the clinical history of the patients shows that all accidents have their source in lack of forethought or technic, or of docility on the part of the patient. The maximum security attends simple extraction, peripheral iridectomy, conjunctival suture, and orbicularis paralysis. Convalescence is abbreviated, and good or normal vision assured.

Operation of Barraquer.

PROF. GALLEMAERTS, Brussels. Extraction of the crystalline in its capsule has been practiced at different periods and its advantages and inconveniences have often been discussed. But because of the inherent difficulties of its execution without depreciation of the eye it has been abandoned.

The operation of Smith and that of Barraquer present anew this problem. I have reported 24 cases operated on by the method of Barraquer, 6 of them under the direction of that master. This communication deals with the accidents that have occurred to me in the 46 such operations I have practiced. Their description may enable those who wish to undertake the new method to diminish the number of their failures.

Every detail regarding the instrument used should receive close attention. The motor should be cleaned, the oil used freed from impurities by filtering thru animal charcoal. It is well to empty the instrument of oil after using it and clean the motor with gasoline. The suction tip must be carefully cleaned of all debris and blood that may be drawn into it, and the power of suction tested before applying. A vacuometer may be attached by intercallating a T-tube. A suction of 55 or 60 cm. can be produced in 4 or 5 seconds. This method of watching the vacuum is not only useful but indispensable.

PREPARATION OF THE EYE.

The prolonged preparation of the patient has been found useless or even harmful. The eye is examined with a slit lamp both to reveal better the form of cataract and to examine the state of the iris. Of 45 cases thus examined, 19 showed degeneration of the pupillary margin, and twice there was atrophy of the posterior layer of the iris. The evening before the operation, the eyes are freely bathed in sterile solution and the permeability of the lacrimal passages tested. The eye is then bandaged after application of 3 per cent silver nitrat, and dressing the eye. An hour before operation, euphthalmin and cocain are instilled. An injection is made into the temple to paralyze the lids and prevent them from squeezing.

OPERATIVE TECHNIC.

The vacuometer and instruments are placed upon a table to the right of the operator, and the apparatus tested just before proceeding to make the corneal incision. The lids are retracted with a Desmarres retractor or with a strabismus hook, which can be more readily introduced and removed. The upper lid is controlled with the hook held in one hand while the other hand draws the lower down. The corneal incision is made in the usual manner, but should include two-fifths of the cornea. It is made in the limbus and completed with a conjunctival flap. A small peripheral iridectomy is made, the operator holding the upper lid with his finger against the margin of the orbit and seizing the iris with a forceps or Tyrrel hook. If there is blood in the anterior chamber, this may be washed away with sterilized solution. Then the operator replaces the strabismus hook under the upper lid, holding it with the left hand and directing the patient to look down and remain quiet. When a vacuum or 55 or 65 cm. has been produced, the suction tip is introduced laterally from the temporal side for the right, and from the nasal side for the left eye. The tip is passed under the margin of the pupil and after it has been accurately placed on the crystalline the button is pressed to establish the communication between the tip and the vacuum. At this instant the vacuum descends to 45 cm. but quickly regains its former state. The tip is then drawn upon, sliding the crystalline in its fossa with a rocking

movement of the handle of the instrument. When well done, this brings the lens with its posterior surface forward. After the crystalline is removed, a solution of eserin in oil is instilled, and some minutes allowed to pass before the iris is reduced by use of a spatula bent at a right angle. The eye is closed with a binocular bandage and dressing. If the patient makes no complaint the dressings are left on the nonoperated eye until the fourth day, and on the operated eye until the seventh or eighth day.

Gallemaerts has seen prolapse of the vitreous occur when the dressing was removed on the sixth day.

Too small a wound impedes the introduction of the tip and the escape of the crystalline. In such a case the incision should be extended by straight scissors with short strong blades. If the conjunctival flap begins too low, it hinders the introduction of the tip. This difficulty has been encountered twice. It requires changing the point of introduction of the tip or raising the flap with forceps. Seizing the iris causes pain and hemorrhage. Detachment of the iris may be produced during the withdrawal of the lens. If this happens the connection with the vacuum should be broken and the tip withdrawn and reintroduced. Hemorrhage into the anterior chamber is usually removed easily by lavage. But in one case a large clot occurred that could not be thus disposed of. Gallemaerts changed the operation of Barraquer into that of Smith, and by pressure with a strabismus hook expelled the lens without loss of vitreous. The most frequent operative accident is failure of the lens to adhere to the tip, or its escape during withdrawal, which is indicated by a characteristic sound. After this the tip should be rapidly removed. In one case the crystalline caught in the opening made by the peripheral iridectomy, and before reintroducing the tip the remaining strip of iris was divided. If other conditions remain favorable, the tip may be introduced several times. He has succeeded at the fourth introduction. But care must be taken not to aspirate the vitreous. In a third attempt, at aspiration there suddenly occurred a sound of suction and the eye collapsed. In spite of the enormous loss of vitreous the lens was extracted with a Snellen loop, but the eye was shrunken. There was no complaint the following day and the dressing was allowed to remain a week. To the operator's great astonishment, the eye had completely restored itself, the wound was united, the patient could see and later gained vision of 6/10. Of all the operations Gallemaerts has done, this was the most extraordinary.

Luxation of the crystalline is a most serious accident. Sometimes it occurs directly upward. It can then be made to slip down with the help of a spatula and another attempt made at aspiration. When the vitreous gets in front of the lens, the only resource is to extract the lens with the loop. Escape of vitreous before introduction of the tip has not occurred in this series. In 2 cases the iris has formed a funnel with the crystalline at the bottom of it. The cornea was rigid and protruding instead of collapsed, and separated from the crystalline by a wide space. The cornea collapsed upon introduction of the spatula. Escape of vitreous may occur after removal of the lens. Sometimes it presents but a moment in the wound; sometimes it bulges between the lips of the wound and the hernia should be excised with the scissors. If a hernia persists for some days, it may be covered with a conjunctival flap. In 2 cases thus treated rapid union was obtained.

RESULTS OF OPERATION.

There is often striate keratitis, which rapidly disappears leaving no trace. In one case the vitreous became attached to the posterior surface of the cornea and caused a dense opacity. Incarceration of the iris in the angle of the wound occurred in one-half dozen cases. In 7 cases the pupil was deformed, deviating upward. But this complication is less serious than with capsulotomy. It is interesting to examine the eye afterward with the slit lamp. The vitreous has been found to protrude thru the pupil in the shape of a mushroom. In one case there was detachment of the retina. Barraquer has stated there could be no adhesion formed between the iris and vitreous, but in one case a very distinct

adhesion of the vitreous to the margin of the pupil occurred. The extraction had been normal. In 2 cases in which the loop was employed, a white mass formed covering the pupil. One of these had been almost completely absorbed and the other was undergoing absorption. The vision obtained was less than one-tenth, 3 cases; one-tenth to four-tenths, 24 cases; five-tenths to seven-tenths, 5 cases.

A critical point in the operation of Barraquer, that upon which success depends, is the moment of pressing the button connecting the tip with the vacuum. An instant of inattention may defeat the operation, or the failure may arise from fault of the apparatus or some untimely movement. It is to reduce such dangers that Gallemaerts has modified the Barraquer instrument. Pump, vacuometer and tip are carried on an adjustable support that can be moved vertically on a rod. If the tip can be modified to make it adhere more securely to the lens, the chances of failure will be reduced to a minimum. It has been denied that the apparatus of Barraquer gave a vibratory vacuum. Gallemaerts and Kleefeld tested this by attaching it to a cylindric box, one end of which was readily movable and carried a mirror that reflected the light of an electric lamp. When the machine was started a very noticeable rapid vibration of the mirror occurred. This was shown by the movement of a beam of light reflected from the mirror. By placing in the path of the light a photographic film, the record of the vibrations was obtained.

Ocular Lesions From Watching Eclipse.

DR. D. KOSTITCH, Belgrade, Jugo-Slavia. The literature of the subject from the time men were blinded by exposure of their eyes to the direct rays of the sun in Syracuse, to the recent papers dealing with the eclipse of 1912, was very briefly reviewed.

The symptoms begin with impairment of vision by prolonged and extreme after images, which may be green, yellow, red, violet or black. The scotoma thus caused may involve the whole word in reading, or only some letters. Some patients complain the letters look as if covered by a spot of ink, which in one case covered only two or three letters, having a greenish-blue color. The ophthalmoscope may show no visible change in the retina, but in the more severe cases the macula seemed a darker red or later shows increased pigment; or there may be early edema. Most frequently it shows one or more dark red spots indicating congestion. Retinal hemorrhage, or white spots have been noted, even hole in the macula. The views of various writers as to the pathogenesis of such lesions are briefly stated. The central or paracentral scotoma produces the lowering of visual acuity. Serious lesions are likely to be produced in those who are emmetropic or have hyperopia that they habitually keep corrected. One patient seen by Kostitch, who had one emmetropic and one slightly myopic eye, suffered central scotoma only in the former, altho no attempt was made to protect the other. Kostitch believes that the luminous rays are those which produce these lesions. The prognosis must always be guarded, but the great majority of cases recover altho sometimes the subjective dazzling and quivering last for many months. In a few the central scotoma is permanent.

Following the eclipse of the sun, April 9th, 1921, which was seen at Belgrade, Kostitch saw 20 cases of ocular troubles caused by looking at it without protection of the eyes. Of these 19 were in college students. Most of them recovered in a few days, several after three or four months. But two showed little or no improvement at the end of five months. The treatment regarded as most effective was complete rest of the patient, abstinence from reading, writing, etc., and the use of sodium iodid. The patients were advised to spend their summer vacation in the country.

Superiority of Organic Grafts of Dead Tissue in Establishing a Mobile Stump in the Orbit.

DR. A. P. MAGITOT, Paris. Since the year 1885, in which Mules proposed enclosing a glass sphere in the sclerotic in order to create a mobile stump, numerous authors have repeated the operation. The question was also discussed

in many scientific meetings, and particularly in 1900 at the International Congress of Paris. It would seem that it might be treated anew in order to determine the results obtained by clinical practice. Moreover, during the last few years, experimental researches on grafts of dead tissue have brought fresh data, by which ophthalmologists should profit in their choice of the substance to be inserted in the funnel of the ocular muscles.

Tho making no pretention to writing the history of the question, we think, that it is necessary to recall the successive stages followed by the different operators. Mules in 1884, had at the same time as von Graefe proposed the amputation of the anterior segment and the evisceration of the eyeball in all cases in which total extirpation could be avoided. In 1885 he proposed closing a glass ball in the sclerotic; in the following years Brudenell Carter, A. Frost, Grimsdale, Lang, Kroll and Kross, Bickerton Swanzy in England, L. W. Fox and Orax, Reeve, de Schweinitz, Buller in America, experimented with the method. The enclosure of a glass sphere in Tenon's capsule was also tried. Later on numerous substances were proposed, rubber (Pick), celluloid (Lang), paraffin wax (Hepburn), asbestos (Claiborne), the pith of the elder tree (Elschnig), etc., but the preference of the authors was for precious metals. Kuhnt (1887) had enclosed silver spheres in the sclerotic, but two years later Wagenmann had occasion to study some of his stumps and came to the conclusion that dangerous inflammatory reactions might be produced. Operators then returned to spheres in platinum and particularly in gold. We know that many American ophthalmologists have made use of this substance, and that certain of their patients have preserved a mobile stump for many years.

To-day, 26 years after Mules' communication, we are able to measure the ground covered. To judge by the results obtained and the opinions published, it seems that many ophthalmologists are agreed to attempts to make a mobile stump in all cases where there is no orbital infection. Some are in favor of evisceration with inclusion of a glass or gold marble. Others, fearing sympathetic ophthalmia, prefer extirpation and planting a sphere in Tenon's capsule. These two methods constitute in fact a part of the foundations on which rests the problem to be solved. The other part is constituted by the choice of the substance to be enclosed.

If we are to judge by the number of illassorted substances which have been employed, this second part of the problem is not the least important. Many substances have not given satisfaction, others are heavy, others are rare and costly. Those which have been employed most often are glass and gold, as being the ones producing the minimum of painful or inflammatory reactions. As a corollary, it is patients operated in this way who have most frequently been presented in scientific societies.

However, for an operation not to have come into universal use, in spite of the examples of wearers of gold or glass spheres who have been operated ten or fifteen years previously, it must have aroused some hesitation and distrust. Many hold that we have not yet emerged from the experimental stage, and leaving to others the onus of experimenting, reserve their opinion until they shall be convinced of the excellence and innocuousness of a method.

Indeed, in spite of a few cases remarkable for their duration and the esthetic effect obtained, it must be confessed that the inclusion of a gold or glass sphere does not always succeed. Precocious or tardy expulsion may take place when the operation has succeeded, and after a lapse of several weeks; it is therefore impossible to assert that the mobile stump will be permanent.

ORGANIC AND INORGANIC SUBSTANCES.

The expulsion of a gold or glass sphere may take place shortly after the operation, when the asepsis has not been perfect or when an accident occurs, such as a hematoma which distends the tissues and brings about rupture of the sutures. But this expulsion can also take place several years later, as if there had been a sort of wearing out of the conjunctiva which covers the sphere. This tissue gradually becomes thinner, a small orifice appears which grows progressively, and

one day the sphere escapes from the cavity without there having been properly speaking any suppuration. Such an accident may supervene just as well as with other inorganic substances such as ebonite, galite, celluloid, asbestos, agar-agar, etc.

As for paraffin wax injected under pressure or fashioned into a ball (Brockart, Camann, M. Ramsay, and Spratt) it likewise has caused many disappointments. Generally speaking its point of fusion is too low. When it is 75 degrees centigrade (like that used by Hertel) its superiority over ebonite lies only in the facility with which the operator can give it the desired shape.

It was certainly for the purpose of obtaining a permanent stump that recourse was had no longer to an inorganic substance, but to living tissue. Baraquez, Verlez, Bartels, Marx, Lauber recommended the use of fatty tissue, usually taken from the abdomen of the patient and enclosed either in the sclerotic or in Tenon's capsule. This method has been repeated sufficiently often these last few years for it to be possible to judge of its value. The results of recent operations are good, those of long standing are disappointing. As Marx has noted in his histologic examinations, the graft is reabsorbed, and the stump becomes of insignificant volume. In 1912 Sattler, and in 1914 Carlotti and Bailleul tried successfully on man the graft of living cartilage, but the long standing results of their transplantations have remained unknown. In 1915 I in my turn tried this method on men wounded in the war, and I was able to convince myself that it offered many serious inconveniences. First of all must be placed the extreme sensitiveness of this tissue to infection, and in consequence of this frequent premature eliminations. Secondly, living cartilaginous tissue, like fatty tissue, is reabsorbed in a few months. This disappearance is the more rapid as the thin and flat human costal fragment is far from being sufficiently voluminous to constitute (even in the beginning) a good stump.

We shall merely make a passing mention of the living heteroplastic grafts of dogs' or cats' eyes (Lagrange, Rohmer, or Boiadeff) whose atrophic evolution is similar, and we shall now speak of a very interesting category of substances. We refer to dead organic transplantation.

Belt, shortly after Mules' communication had the idea of implanting in the Tenon capsule a piece of sponge, following in this a study of Hamilton's which appeared in 1881. Hamilton had repeated experiments already made by Stricker (of Vienna), consisting in keeping under supervision the evolution of aseptic sponges introduced into the peritoneum of laboratory animals. He had noted that the framework of the sponge served as guides for the vessels to fresh connective tissue, and that at the end of a certain time the organism completely incorporated this exogenous tissue. Belt's experiment was renewed by Trousseau and by Valude. These operations were not successful; elimination took place in the first few days. Much more favorable were the attempts of Schmidt (1910) who made use of globes of bone sterilized by steam. There was no elimination and the stump kept its primitive dimensions. De Wecker, Kuhnt, also obtained favorable results with sterilized bone, and if this method has not become more universal, it is probably due to the difficulty of finding spheres cut to the necessary dimensions (fifteen to twenty millimeters in diameter) and ready for use.

In 1915, having had disappointments in attempting to graft living costal cartilage in Tenon's cavity, I had the idea of practicing on wounded soldiers inclusions of calf cartilage fixed in 20% formalin for a week, and then carefully washed. My intention was to proceed by two stages. First to make an inclusion of dead cartilage, preliminary operation, whose object was to avoid elimination of the living cartilage which is so sensitive to infection. I desired in this way to get over the dangerous period, and three months later to remove the temporary inclusion and graft in its place costal cartilage, which according to my idea was to form a permanent stump.

The insertions of formalinised cartilage were successful, but my astonishment was great on finding that after several trials the living transplant rapidly diminished in volume, whereas the first had not

varied. I therefore modified my mode of operation and systematically employed in all cases of extirpation inclusions of formalinised cartilage. In 1917 I presented to the Paris Ophthalmological Society, a number of patients operated since twelve months. In 1918, I presented some more, but I published no treatise on the subject, wishing to submit the process to the proof of time. To-day, after six years' practice, and an experience of sixty cases, I can speak with a full knowledge of the subject. In the meanwhile, researches on grafts have made clear certain obscure points. They have brought to light certain biologic conditions which it is indispensable to know.

TRANSPLANTS OF DEAD TISSUE.

For a very long time it was believed the only living tissues could be grafted, that is to say, once transplanted they were accepted by their host's organism, and that they continued to live on their own account. All that was known was that the chances of success were slight and that even under the most favorable conditions (autoplasty) there were for grafts without pedicle about 40% of failures. In the years following, the great war, a considerable number of prosthetic operations were attempted on the limbs, radiographic examinations were multiplied, experimental studies were carried out, and it was discovered that the vascular, osseous, tendinous or nervous grafts which appeared to be really living, in reality died a short time after their transplantation. But, and this is of capital importance, it was remarked that simultaneously their carcass served as a framework for a young tissue, the newly formed cells of which took the place of those of the transplant. This phenomenon occurs on condition that there be contact between the graft and the tissue of similar nature of the organism of the host.

Here is therefore a new conception of living grafts which revolutionizes our old ideas, and explains the bad results obtained by transplantation into the orbit of living cartilage. It is a sort of biologic law to which the only exceptions appear to be the cutaneous epithelium and the corneal epithelium.

But if all living tissue (nerve, bone, cartilage, tendon) dies, it must be remembered that its presence suffices to provoke the apparition of young cells of the same nature, and it comes to mind immediately that a transplantation of dead tissue ought to provoke the same phenomenon. Experiments have shown that this is so, and that nerves, tendon or bone killed by alcohol or formalin fulfilled quite as well and even better their rôle as framework for the new tissue. These facts explain Hamilton's remark, which we have previously mentioned, and enable us to understand how an aseptic sponge can be invaded by connective tissue. For the same reason we can no longer feel astonished at the good results obtained by Schmidt and by Kuhnt, in making use of bone to execute Mules' operation.

Professor Nageotte (Paris) has likewise shown (1920) how the tissues of the nose act differently with an inorganic transplant such as glass, gold, ebonite, etc., and with a transplant of organic tissue killed by histologic fixation.

A disc of glass, silver or of rubber inserted under the skin of a rabbit's ear causes no reaction of the tissue: it encysts and the membrane of this cyst is itself insignificant. If the pocket be opened, the foreign body will be found there in a state of liberty. The result is quite different if we insert, in the same place, a disc of bone or cartilage previously fixed in alcohol or formalin, that is to say, a disc of substance organized but deprived of life. Union almost immediately takes place by continuity of substance between the inserted piece and the connective tissue of the host. In the case of cartilage, this adherence takes place thru the perichondrium. In the case of dead bone an analogous phenomenon occurs. The natural surfaces adhere to connective substance of the host, but neither in the case of cartilage nor of bone do the surfaces of section join with it.

Independently of this union between dead and living tissue, a phenomenon which already differentiates entirely the

inclusions of organic or inorganic substance, there appears later a new factor of great interest. When the transplants are osseous or cartilaginous, there appear at the points of contact of the dead tissue osseous nodules or again cartilaginous nuclei produced by the connective tissue of the host. It follows that, at the end of a certain period, a fresh skeleton piece is formed which envelops the transplant. The latter enveloped in a living sheath will persist unless young living tissue substitutes itself for it progressively.

From these facts, we now know that when introduced into the organism, organized substances, even when they are deprived of cells and unable to be reinhabited, take up once more a rôle in the life of the tissues. We have at the same time the explanation, not only of the perfect toleration of dead cartilaginous or osseous fragments transplanted into the orbit, but also of their persistence without diminution in volume.

CARTILAGE FIXED IN FORMALIN.

I chose cartilage in preference to bone because it can be cut as easily as a potato. The sternal piece of large sized calves is, however, the sole material voluminous enough to allow the cutting out of fragments of twenty to twenty-five millimeters in thickness and of the length required. One should be very careful not to remove the perichondrium, as this membrane will be the point of union between the transplant and the tissues of the host. This fresh cartilage is fixed for eight to ten days in a solution of 20% formalin. The formalin is then decanted and replaced by sterilized water. This substance is ready for use two weeks later, when it has had time to disgorge the fixing product. This formalin will permeate the water, and in this weak antiseptic solution, the fragments will keep indefinitely, forming a reserve on which one can draw according to requirements.

The mode of operation I followed is very simple. After extirpation the fragment is inserted into the muscular funnel. It is necessary that hemostasis should be complete. The edges of the muscular plane are seized with small clips, the vertical traction of which keeps the pocket open. The fragment, which should be as large as possible, is then pushed into the bottom, and the pocket is very carefully sutured with catgut. Over this muscular layer, the conjunctiva must be closed with U shaped stitches so as to make sure that the edges meet perfectly. I terminate the operation by a temporary blepharorrhaphy which I relieve on the third day. This sealing of the eye lids is a precautionary measure in case of secondary hemorrhage, which would distend the pocket. Its effect is to prevent the chemosis which often results from the rubbing of the eyelashes on the conjunctiva.

The patient is then furnished with a binocular dressing for three days in order to immobilize the ocular muscles.

Since 1917 I have always followed this same technic, after having assured myself of its perfect efficacy.

I consider as essential:

1. The sutures of the muscles and of the conjunctiva in two planes with separate stitches.
2. Complete hemostasis.
3. The inclusion of a voluminous cartilage, from which the perichondrium must not have been scraped off.
4. A binocular dressing for three days.

All those who may try the implantation of formalinised cartilage by this method, will perceive the ease with which the organism accepts this dead tissue. Except in the case of panophthalmia or of orbital infection, recourse may be had to it, and I have had numerous successes after extirpation for laceration of the eyeball by projectiles of war. Elimination in the first days will take place only if there is infection, serious hematoma, and if the cartilage has been deprived of all its perichondrium. But if there is no elimination in the first fortnight, the transplant may be considered as permanent, for in my cases I have never had a tardy elimination.

Dead cartilage offers the great advantage over living cartilage of being able to furnish voluminous fragments.

Whatever its origin may be, it is nevertheless always made up of pieces rather long than thick. The cross section is at the two extremities, whereas the other faces are covered with the perichondrium. When inserting the transplant into the cavity, I proceed so that the sides covered with this connective sheath may be in contact with the rect. int. and ext. muscles, so that the adherence may take place principally with the muscles which control the horizontal movements.

MARSUPIALIZATION AND TRANSPLANTATION.

I have just spoken of the transplantation of formalized cartilages at the moment of extirpation. This operation is, however, still possible in cases of long standing extirpation, where the patients are not satisfied with their immovable stump. The only conditions required are: a clean conjunctival cavity and, behind, a small mobile cluster formed of retracted muscles. Briefly, extirpation must have been practiced in a proper manner.

The problem consists in creating in the midst of the fibromuscular mass at the bottom of the orbit a pocket (marsupialization), in the middle of which will be inserted the fragment of cartilage. This result is obtained by incising and then freeing the conjunctiva from its deep attachments.

The fibromuscular mass is then seized by its center, an opening is made in it and this is enlarged by means of a forceps. The edges are drawn forward and the cartilaginous transplant is pushed in. The muscles are then sutured with catgut, the conjunctiva with silk, and we terminate by a blepharorrhaphy as in an ordinary operation.

In December, 1921, I presented to the Ophthalmological Society of Paris an officer who had been obliged to undergo the operation of extirpation during the war. Two years later, immediately after the armistice, he came to see me, complained of his immovable stump, and asked me to remedy it. He was operated in February, 1919. The consequences of the operation were very simple, and since three years he has been wearing a movable stump which has not diminished in volume. The transplant, which is very large, raises the eyelid well, and avoids that ugly fold which cannot be prevented in ordinary enucleation.

CONCLUSION.

The superiority of inclusions of dead organic tissues to living tissues is established by clinical practice. When the inclusions are assimilated by the organism, they do not diminish in volume. The fundamental difference between inclusions of inert unorganized tissues, such as glass or gold, and dead organic tissues, such as bone or cartilage, lies in the fact the former are foreign bodies tolerated and encysted, whereas the latter are adopted and young osseous cells are seen to appear in them. The former may be expelled one day, whereas the latter, once admitted, are permanent.

These inclusions may be made at the same time as the extirpation, but they can also be effected on extirpations of long standing, provided that this extirpation has been properly made. It is in this case necessary to create a pocket in the middle of what remains of the muscles, but the results obtained are often excellent and comparable to the best stumps consecutive to amputation of the anterior segment.

Bibliography of 31 references.

Peritomy for Chronic Vascular Ulcers of the Cornea.

DR. ANTONIO F. ALONSO, Mexico City. The systematic treatises on ophthalmology commonly recommend peritomy for the cure of pannus arising from trachoma. Duane has suggested it for episcleritis, corneal herpes and rosacea keratitis. Verhœff suggests it for neuropathic conditions. Terson regards it as a valuable remedy in vascularization of the cornea including certain ulcers. There is a group of chronic vascular ulcers of the cornea, extremely rebellious to ordinary treatment, for which peritomy proves very effective. The ulceration seems to be kept up by persistent, tortuous,

superficial vessels that seem not to be susceptible to the influence of adrenalin. These ulcers are situated near the center of the cornea at the termination of the visible vessels, are sometimes discovered only by a magnifying lens and frequently accompanied by corneal scars. They usually do not stain well with fluorescein. Other methods of treatment are useless and they yield promptly to peritomy. Three cases are reported. The first in a scrofulous woman of 30 years, with vision reduced to 1/3, presented two ulcers and vessels hardly visible. She was under treatment 9 months without improvement, but peritomy at the upper margin of the cornea done with a galvanocautery gave complete cure in 15 days.

The second patient, a boy of 12, had suffered from keratoconjunctivitis for several years. The ulcers had been treated by many oculists without good result. Peritomy was practiced at the lower nasal margin of the cornea, and in 10 days the ulcers were absolutely healed.

The third patient, a woman of 50, had received tuberculin treatment for lupus without result as regards a central ulcer of the cornea, to which two or three slender tortuous vessels made their way from above. She had been under treatment one and one-half years. Peritomy by cauterization produced improvement within three days and complete healing in 20 days, with vision of 1/10. Every such patient should have the cornea examined with a lens to discover the vessels which maintain the lesions. The frequency of these ulcerations, their resistance to ordinary treatment and unfavorable effect on vision demand that systematic writers and teachers of ophthalmology give them more attention.

Types of Pneumococcus Found in Corneal Ulcers.

DR. ROBERT CARTWRIGHT CHENEY, Boston, Mass. In 1902 Römer, realizing the inadequacy of the treatment of pneumococcus ulcer of the cornea and the disastrous end result as far as useful vision was concerned, attempted serum treatment in these cases. Using small doses of immunized animal serum, he had promising results in rabbits. In men, however, the results were by no means as striking, and in the five cases treated only three were apparently successful. These three patients were only 43, 31, and 16 years of age, and hence had a much better chance of recovery under any treatment. The serum treatment has never proved of any clinical value and has never supplanted cauterization or other previously recognized forms of therapy.

In recent years the value of serum treatment in cases of lobar pneumonia has apparently been proved and a very satisfactory summary is given in a monograph from the Rockefeller Institute by Avery, Chickering, Cole, and Dochez. It was found that pneumococci might be divided into IV types on the basis of their specific immunity reactions. To quote directly, "pneumococci of types of I, II, and III, compose about 80 per cent of all strains encountered in disease, and represent three apparently fixed types of highly parasitic organisms, each possessing common immunologic characters." Type III is the pneumococcus mucosus. Type IV pneumococcus is a heterogeneous group, and is mostly made up of individual strains which are not interrelated and do not have a common agglutination reaction with any single immune serum. In short, it is possible to obtain three stock sera. Types I, II, and III have specific agglutination reactions for the corresponding types of pneumococci; but as is evident from the preceding statement, there is no type IV serum, and a pneumococcus which does not agglutinate any of the three sera is relegated to the type IV group. In the actual clinical application of the sera, the type I serum in large intravenous doses is seemingly highly effective in lobar pneumonia caused by a type I organism, but of no use in a case caused by a pneumococcus of another type. Type II and III sera as yet have not been proved to be of clinical value.

In view of the above facts it seemed important to ascertain the types of pneumococcus found in corneal ulcers, with the hope of finding an ulcer caused by a type I organism which might advantageously be treated with serum.

Some difficulty was encountered at first in obtaining a satisfactory culture medium, as naturally comparatively little material for inoculation is obtainable from a corneal ulcer. Intraperitoneal injection in white mice was not satisfactory, but Avery medium proved to be just what was needed, and I never failed to get a growth from a pneumococcus ulcer when this medium was employed. It was described by Avery in 1918, and is a meat infusion broth three-tenths to five-tenths acid to phenophthalein. To each 100 c.c. of broth is added 5 c.c. of 20% sterile glucose solution and 5 c.c. sterile defibrinated blood.

The following was the method of procedure: The eye was carefully cocainized, a speculum inserted, and as much material as possible obtained by curetting the advancing infiltrated edge of the ulcer, which was found to be the only place where pneumococci were plentiful enough to give a satisfactory culture. Great care should be taken not to traumatize the normal corneal tissue, and the ulcer should be cauterized immediately after curetting, as curetting alone tends to make the process somewhat worse. Next, a tube of Avery medium was inoculated with the material so obtained and, after careful shaking, was placed in the incubator for six to ten hours, at the end of which time the blood corpuscles had settled at the bottom of the test tube. The supernatant fluid was almost always found to contain a pure growth of pneumococci. From this the type was ascertained by direct microscopic agglutination with the sera obtained from the New York State Board of Health, and the solubility of the organisms in bile determined (pneumococci soluble in bile, streptococci not). Römer called attention to the usual occurrence of a pure growth in pneumococcus ulcer of the cornea, obtaining 18 pure cultures in 20 cases. Thus no centrifuging was necessary, and the culture was directly grouped, the reaction being a combination of agglutination and precipitation. Care should be taken, however, not to allow cultures to go over 10 to 12 hours as the organisms in Avery medium form acid which soon kills them.

During a period of over a year, at the Massachusetts Charitable Eye and Ear Infirmary, cultures were obtained from 12 cases of pneumococcus ulcer of the cornea. These were pure cultures with but one exception, where there was a slight growth of staphylococcus. In eight of these cases the organism was type IV pneumococcus, while in the other four cases it was type III pneumococcus. No type I or type II organisms were found, the percentage being 66.6% type IV, and 33.3% type III.

Of the 12 corneal ulcers studied by me, 11 were clinically typical serpent ulcers, but one case needs special description: A boy 13 years old with a severe membranous conjunctivitis and a very superficial corneal ulceration which was secondary to the conjunctivitis. Type III pneumococcus was isolated from the conjunctiva. This eye recovered quickly with no impairment of vision.

In lobar pneumonia, type III pneumococcus is by far the most virulent, carrying a 45% mortality, so naturally there arises the question of prognosis in eye infections as determined by the type of pneumococcus. In this extremely small series with various methods of treatment, etc., no definite evidence is obtainable, but it does seem significant, that in the 11 cases of serpent ulcer, the only two eyes that required enucleation during the patient's stay in the hospital were infected with a type III organism.

The failure of serum in pneumococcus ulcers of the cornea is adequately explained by the fact that none of the organisms are of type I. The present pneumococcus sera obtainable have little, if any, specific action on organisms in the cornea and absolutely no benefit is to be expected from their use. That the type IV pneumoccoci found

in the cornea belong to one definite subgroup for which there may be a specific serum, is possible but not probable.

Passage of Water and Ions Thru Cornea.

DR. VICTOR MORAX, Paris. In the absence of Prof. Morax, his paper was briefly presented. The subject is one that interests the ophthalmologist, because on it rests the most important part of his local therapeutics; the absorption of drugs like atropin or pilocarpin passing thru the cornea into the anterior chamber and so reaching the iris tissue. The effects of such passage are well known, the mechanism producing it is ignored. It has been studied only from the chemical point of view. It should be taken up with regard to the new conceptions of the osmotic tension of solutions and the ionic constitution of salts.

Studies of this kind were undertaken in collaboration with Girard and Mestrézat, of which certain results interest the oculist and physiologist, especially the modifications that can be produced in the volume and chemical constitution of the aqueous. The latter depends on the permeability of the cornea to the substances which bathe its external epithelium.

To change the volume of aqueous, electric osmosis has been practiced on the living eye, in the living animal. One pole is plunged into the solution of the electrolyte in which the cornea is bathed. When this is a solution of magnesium sulphat, endosmosis in the eye of the rabbit will raise the tension of the globe, from about 25 to 50, or even to 70 mm. of mercury. On the other hand, with the same polar attachments, using a solution of calcium nitrat, exosmosis may reduce the tension of the eyeball to 8 or 10 mm. of mercury. This can be accomplished without causing any lesion of the cornea, not even edema, by using a current of not over 2 milliamperes. In eyes with normal circulation and no obstruction to drainage, such changes of tension pass away in about an hour. These changes have been made in the eye of the rabbit, but not yet in the human eye.

There seem to be great therapeutic possibilities in the modification of the ionic constitution of the aqueous, by diffusion of substances thru the cornea. This may be effected thru the influence of the electric field, or by simple diffusion. By the collaboration of Girard and Mestrézat, using the methods of microchemistry, it has been demonstrated that when the anterior surface of the cornea has been kept bathed with the solution of a certain salt, it is not the salt as such that diffuses thru the cornea; but the two ions that compose it which diffuse, not in their chemically equivalent proportions.

For example, solution of magnesium sulphat bathing the front of the cornea does not reach the aqueous, as sulphat of magnesia—an equal number of anions and kations; but many more magnesium ions will diffuse than those of the sulphuric acid, and this will lead to the displacement probably of a number of sodium ions equal to the excess of magnesium. With some of the monivalent salts of ammonium this inequality is very great; the anions (acid radicals) diffuse in such excess that there exists practically a true ionic hemipermeability of the cornea. This elective permeability of the cornea can be used to make the aqueous more alkaline or to render it slightly acid. It can occupy a most important place in ocular therapeutics.

(*To be continued*)

American Journal of Ophthalmology

Series 3, Vol. 5, No. 9 September, 1922

PUBLISHED MONTHLY BY THE OPHTHALMIC PUBLISHING COMPANY

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SYMPATHETIC OPHTHALMIA.

When the neurosis called sympathetic irritation and the obscure cases in which the retention of a badly damaged degenerated eye is suspected of causing amblyopia of its fellow have been excluded, we have in sympathetic ophthalmitis, or true sympathetic inflammation, a well differentiated type of disease; and one that in many respects must be classed by itself. Sympathetic ophthalmia presents difficult problems, the solution of which will throw light on the pathology of many other diseases; while the fact that it is likely to destroy the sight of the patient's useful eye gives the strongest incentive for us to understand and master it.

The features of the condition that challenge our attention and investigation are: 1. It is always secondary to pathologic changes in the eye usually starting with trauma. 2. A period elapses after the injury, or gross disease of the one—the exciting eye, before sympathetic ophthalmia attacks the other. 3. Certain histologic changes occur in the exciting eye before the sympathizing eye is affected, and then quite similar changes occur in it. 4. The pathologic changes include the development of what closely resemble infective granulomata, especially those of tuberculosis and sporotrichosis. 5. The disease shows a strong tendency to improve and then relapse, with gradual increase in the pathologic changes until useful vision is destroyed. 6. Removal of the eye primarily injured or diseased prevents the disease of the eye; except in a few cases in which sympathetic disease has appeared in the other eye shortly after such removal. 7. Prompt removal of the exciting eye after the appearance of sympathetic ophthalmitis greatly improves the prognosis of the case. 8. Vigorous treatment with salicylates and mercury has some value in controlling the disease. 9. The uveal tract is always involved in the lesions, but all the tissues in the eye are likely to be affected. 10. Eyes affected with this disease show little or no tendency to caseation of the products of inflammation, but a rather marked tendency to ossification.

Ever since it was recognized as a distinct pathologic condition, sympathetic ophthalmia has been an attractive subject on which to theorize. As channels of transmission, the optic nerves and chiasm, the nerve sheaths, the branches of the trigeminus, the sympathetic nerves, the blood channels of the orbit and the general blood stream have all been invoked. To account for its tendencies, nerve influences, bacterial invasion, bacterial toxins, cytotoxins, anaphylaxis and focal infections have all been suggested. The possible bearing of each new observation in pathology has been speculated upon; one of the latest being the comparative rarity of the disease under the surgical methods applied during the late world war. It is evident that essential facts are still lacking from our knowledge, which additional close observation alone can supply.

Meanwhile we have learned, empirically, some things that can be done to lessen the number of cases of blindness produced by sympathetic ophthalmia, as: Early enucleation of eyes blind after trauma, particularly in children; careful antisepsis in the treatment of wounds; the free use of salicylates in plastic inflammations following trauma, and the prolonged use of mercury; care to secure and maintain the highest plane of general health in the patient; a long period of complete absence of inflammatory symptoms, before operative interference with an eye damaged by this disease. Without neglecting any of these points, we can turn hopefully for new light to the test proposed thru pigment sensitivity, and what other new suggestions are based on careful observation and reasoning in the clinic and laboratory. E. J.

INDUSTRIAL BLINDNESS.

Absolute blindness is rare and of only scientific and academic importance. Practical, economic, or industrial blindness—the reduction of vision to the point where it ceases to be a practical guide and assistance in labor and recreation—is much more frequent and raises all the legal, educational, economic and social welfare problems that grow out of blindness.

In adopting a declaration of what should be considered industrial blindness, the Section on Ophthalmology of the American Medical Association took an important step toward placing on a definite basis the estimation of damages and of proper compensation for industrial injuries to vision. It also established a standard that should be considered and adopted in laws providing pensions or other relief for the blind and the administration of such laws; and for the admission of applicants to schools, homes and other public institutions for the blind.

There has been great confusion and disagreement as to what constituted practical blindness. It is a matter of common observation that one person accomplishes a great deal more than another with the same visual acuity and power, as measured by scientific tests. Nevertheless, standards must be established in order that justice may be done between man and man; and that the individual possessed of superior energy or industry may secure the proper reward of the greater effort he puts forth.

The divergence of views as to how visual disability should be estimated was apparent in the discussion that took place in the section, before action was taken on the reports from the committee that has been studying the subject. There were majority and minority reports. But with reference to the standard for industrial blindness, the committee was unanimously agreed; and no serious objection was raised in the discussion to the standard suggested, that the eye or the person with less than one-tenth vision, say 20/220, should be regarded as industrially blind.

This subject has long claimed the attention of ophthalmologists, and the committee above referred to had considered it for several years before offer-

ing a tentative report last year, which was referred to local ophthalmologic societies for their consideration and discussion. After such prolonged study and consideration, the unanimous adoption of this standard should be regarded as giving us a fixed basis for laws, rulings and practice with regard to the blind and their care, and the fixing of economic relief.

If ophthalmologists and their societies will at once adopt and advocate the acceptance of this standard, it will help to bring order out of confusion, and promote uniformity of practice and statistics that has been sadly lacking. In one state the sentimentalists charged with the administration of a blind pension law have ruled that vision of less than five-tenths should be considered "blindness," entitling the applicant to a pension. It is not surprising to find under this administration, the principal city of this state is paying as much for blind pensions as a city ten times as large working under an essentially similar law in another state, but with a more reasonable standard for industrial blindness.

The problems that have to be worked out and dealt with in regard to partial destruction of the visual function are numerous and complicated. But very little progress toward their solution or intelligent discussion was possible, until some standard of what should be regarded as industrial or economic blindness was agreed upon. Starting from this point, it becomes practical to consider how loss of vision in one eye, loss of binocular vision and loss of part of the visual field should be regarded. Then should a certain impairment of visual ability be similarly regarded in every citizen; or should occupation, age, previous earning power, etc., be considered in awarding compensation. With 48 different state legislatures to deal with these questions, there is prospect of confusion in laws and practices for a long time. There is still great need for intelligent enlightened leadership in regard to these matters on the part of ophthalmologists. E. J.

BOOK NOTICES.

Wilbrand, H. and Saenger, A. Die Neurologie des Auges, IX Band. Die Stoerungen der Akkommodation und der Pupillen; und Gesamt-Register zu den Baenden, I-IX. Pages 320 and 154, 17 illustrations. Munich and Wiesbaden. J. F. Bergmann. 1922.

This volume completes a monumental work. The enormous and swiftly growing literature of ophthalmology becomes really available for the information of the practising ophthalmologist, only as it is carefully worked over, condensed and arranged in monographs; by students who are content to devote to this work of digesting the existing literature, energy that would probably bring greater rewards in the fields of original research or private practice.

Wilbrand and Saenger, in their collaboration to render serviceable the great literature of the relations of the eye to the nervous system, have won a right to the respect and gratitude of all students of ophthalmology of the present and future. Their work of selection, condensation and arrangement has been well done. It reaches a climax in the subject index of 154 double column pages, which renders directly accessible practically everything in the world's literature relating to the neurology of the eyes. Lists of authors names and complete bibliographies of all included subjects are supplied in each volume. The bibliography referring to the accommodation and pupil includes 1080 references, and is as near accurate and complete as seems humanly possible.

The consideration of the accommodation of the eye and its disturbances occupies but 25 pages, probably in recognition of the fairly complete representation of the literature relating to it in chapters and monographs upon the refraction of the eye. Brief notice is accorded to its relations to anatomy and its physiology, its range, its relation to convergence, its influence on the apparent size of objects, etc. Then 9 pages are devoted to paralysis of ac-

commodation, and 5 to spasm. In this brief chapter there are over 100 references to papers and monographs, and with most of them brief condensations into a few lines of the important points of case reports or long papers.

The chapter on disturbances of the pupils opens with an account of the anatomy and movements of the musculature of the iris. The processes that produce a narrowing of the pupil are reviewed, the light reflex, the physiology of the pupillary movements and the narrowing of the pupil with accommodation and convergence. Next the processes which produce widening of the pupil are taken up, the reflex to irritants, the psychic and brain reflexes, vestibular, voluntary dilatation of the pupil, etc. After that the ciliospinal center and the part of the cervical sympathetic are considered; and the paradoxic, myotonic, neurotonic and vagotonic reactions are noticed.

The absence of the light reaction of the pupil is spoken of as reflex pupillary rigidity, and is accorded 66 pages. It is probably better to give this condition a name based on its essential character, and not to designate it as the pupil or phenomenon of Argyll Robertson. But it seems strange that the name of this worker who brought the phenomenon to the attention of ophthalmologists in 1869 is given the barest incidental mention in connection with it; and in the bibliography no reference is given to volume XV of the Edinburgh Medical Journal in which was published his paper on "Four Cases of Miosis in Spinal Disease," or to any other of his writings. This omission illustrates the impossibility of a perfect bibliography. The fact remains, that those of Wilbrand and Saenger are as near complete as have ever been compiled, with regard to such extensive and widely scattered literature.

The discussion of this subject of pathologic absence of the light reaction is complete and systematic. Its development, diagnosis and relations are followed by discussions of theories for it. Its occurrence in tabes and paralysis, its etiology, both syphilitic and non-syphilitic, and its course, are all shown in the light of recorded cases. The unilateral occurrence of the symptom is noticed. The following list of non-syphilitic causes will surprise some who have regarded this symptom as conclusive evidence of syphilis: Brain tumor, meningitis, trauma, apoplexy, polioencephalitis, epidemic encephalitis, Friedrich's disease, mental diseace, alcoholism, nicotin poisoning and diabetes, all cause it.

Absolute and katatonic pupillary immobility are considered. Then, under the heading of abnormal width or narrowness of the pupil, all forms of mydriasis, miosis, anisocoria, "springing" mydriasis, the shape of the pupil, spasm of the sphincter and spasm of the dilatator are discussed. The body of the book concludes wih a 30 page general review of what is known of the behavior of the pupil under normal and pathologic conditions, in congenital anomalies, and the effects of disease on the nerve tracts.

For ophthalmologists and neurologists who wish to have at command the literature of this subject, this work of nine volumes, some 5630 pages, with hundreds of illustrations and thousands of references, is invaluable. The whole medical profession and the people they serve are indebted to Wilbrand and Saenger for the careful conscientious work they have done on it. Prof. Saenger's career is already closed, and a short biographic note from his colleague opens this volume. From Prof. Wilbrand, whose energies are now released from his selfappointed task of more than 25 years, we will still hope for contributions to our literature, enriched by the results of these completed labors. E. J.

Ophthalmological Society of Egypt. Bulletin of 1921, 80 pages, 8 plates, 6 in colors. Edited by the Hon. Secretary, Cairo, 1921.

This society, which was established in 1902, is now affiliated with the Ophthalmological Society of the United Kingdom, but continues to publish its annual bulletin of transactions. The title of the volume is printed in Ara-

bic, French and English, but of the 12 papers, 11 are published in English and 1 in French. In addition to these scientific papers, there is a committee report of 14 pages on "The Means of Prophylaxis against Trachoma and Ophthalmia;" the constitution and rules of the Society, the list of its members, 78 active, 12 honorary; the report of the annual meeting which is held the last of February or beginning of March; a list of abbreviations used, substantially the same as that of the Ophthalmological Society of the United Kingdom; and instructions for sending specimens for examination. All these are in English. On the back of the title page is printed the notice, that microscopic examination of tumors will be made free of charge for members of the Society, if the instructions for sending them are carried out.

One of the papers illustrated by plates is upon the sclerocorneal junction, its clinical description, its importance in slight forms of trachoma and its anatomic topography as regards intraocular operations. The other illustrated paper is upon retinal hemorrhage after nonperforating injury of the globe, reporting two cases. Other important papers are on an epidemic of cases of purulent ophthalmia complicated by herpetiform eruptions, 3 cases of streptothrix infection of the conjunctiva, a case of ptosis cured by Motais' operation, a case of arteriovenous aneurism of the orbit, an account of Curran's iridotomy for glaucoma, and a paper on milk injections and their therapeutic value in various diseases of the eye.

This pamphlet reflects scientific activities extremely creditable to a society of less than 100 members, meeting but once a year, and not supported by a highly organized general profession and established educational institutions, such as exist on Western Europe and America. It must be a source of satisfaction to those leaders in ophthalmology whose examples have brought about the existence of this organization and stimulated its scientific work. E. J.

CORRESPONDENCE.

"Wrestler's Trachoma."

To the Editor: In as much as my observations are made the left handed introduction for Dr. Patton's communication, under the above caption, in your July issue; and his findings are not only so positive, but so positively in variance with mine, it seems appropriate that I should draw renewed attention to the essential points of difference in our respective observations.

In the first place, I considered only the cases with which I had been in touch for 20 years or more, where the picture of trachoma was complete, (trachoma bodies, intervening scar tissue, and corneal irregularities); so that there could be no question about the diagnosis. Dr. Patton can have no such sure ground in cases of 10 days (or 10 weeks) duration. He may be willing to let his reputation stand or fall by a positive dictum in the primary inflammation, but until the status of conjunctivitis presenting swollen follicles has definite placement, I must reserve my decision. And a prompt cure with astringents and expression appears to me as really the opposite of conclusive for the diagnosis.

Again; my patients were not professional wrestlers—just husbands, wives, parents and children; and while I have never heard of any "rough house" among them, I can hardly imagine such a freedom from minor accidents and grief as to preclude the possibility of motherly eye wipings, and not always with sterile hands. (N. B. I am still awaiting a better explanation for the complete subsidence of trachoma in the 6 families whose histories I recorded, where, on the interhuman contact theory, it should have been widely disseminated.)

Finally: In my suggestion that an intermediary host might better explain the spread of trachoma, I find that I am not alone. From a study of emigrants freshly landed, and many years experience with trachoma as exhibited in the Massachusetts Eye and Ear Infirmary, Dr. Myles Standish has reached conclusions similar to, tho not

identical with, mine. A letter from him to this effect is enclosed; and I feel that I violate no confidence in allowing you to quote from it, by way of postscript, as freely as you see fit. In the event that one or the other of our intermediary host deductions should bring order out of the present confusion, any skepticism about contagion would be justified. In the mean time it might be well to have wrestlers' sleeping quarters inspected for both kinds of carriers. Sincerely,

H. B. YOUNG.

Burlington, Ia.

Transmission of Trachc na.

Dear Doctor Young: I have just been reading your article in the last Transactions of the Academy of Ophthalmology and was much interested in it.

Trachoma is certainly contagious in the sense that it is definitely known that it will spread among the inmates of soldiers' barracks, orphan asylums, prisons, etc., but how?

I have been most of my professional life connected with the Massachusetts Charitable Eye and Ear Infirmary, and for at least 20 years of that time it was our custom to take trachoma patients into our wards with no more than ordinary precautions against infection, and during all that period I never saw but one case in which there was a suspicion that the trachoma had arisen in the hospital.

Living in Boston, where large numbers of foreign emigrants are dumped down yearly, it has been my fortune to see a great many persons who affirmed that they had contracted the disease aboard ship. Many of these I knew from the stage of the disease were just plain liars. Nevertheless, I have seen a large number of acute cases in patients who had been in the country only two or three weeks, and who would have never gotten by the immigration officers if their eyes, at the time they landed, had been in the condition they were when I first saw them.

I have been forced to accept the fact that they probably did acquire the disease aboard the ship. I have deduced from these facts the theory that you have tentatively advanced, that the disease requires an intermediate insect host, and have frequently said that the above facts pointed most strongly to the bed-bug as the insect that disseminated the disease.

Such a theory would be equally applicable to your cases, for the rise in social status and cleanliness would limit the extension of the disease in these families.

Thinking you might be interested in my point of view, as I came to a parallel conclusion with yourself, from the observation of an entirely different group of cases, I am writing this.

Very truly yours,

MYLES STANDISH.

We asked Dr. Standish for permission to publish the above letter, and he added the following comments. (Ed.)

When, some years ago, trachoma was much more common in New England, we had at the Infirmary every spring a group of trachoma cases among loggers, who spent the winter in lumber camps in the woods. The wooden camps in which they had lived thru the winter were, of course, ideal habitats for bed-bugs.

I once read in some ophthalmic literature an account of a military barracks, in Spain if I remember correctly, which was abandoned on account of the amount of trachoma among the soldiers. It was closed for a year or two, and then a battalion was placed therein, with the result that a large percentage of the new troops promptly developed trachoma. I do not know how long a bed-bug lives, but they have been known to live a year sealed up in a bottle in a laboratory.

I asked a Public Health Service physician who had worked among the Kentucky mountaineers in the campaign against trachoma whether the bed-bug was common in the homes of the sufferers from the disease. He replied: "They are very common, in fact, you might say they were present in the houses of every case of trachoma in that district."

Modern hygiene has greatly improved the conditions of public institutions during the last decade or two, and altho the institutions are just as crowded as ever, epidemics of trachoma in institutions are practically unknown at the present time.

I have had under my care single cases of trachoma in well-to-do cleanly families, when the disease persisted for a year or more in the affected person, yet no other contracted the disease. That this was due to care may have been the case, but when we consider how acute conjunctival and other infections which are conveyed by discharges from the eyes and nose spread in similar families, in spite of all precautions, I am not inclined to accept that explanation.

Very truly yours,
(Signed) MYLES STANDISH.

"Perimeter of Variable Radius."

To the Editor: In looking over the March number of Oph. Lit. for something else, I have just come across the description of Vincentiis' Perimeter of Variable Radius, a publication which clearly gives him priority over myself as regards the principles of the perimeter, description of which I sent you some little time ago.

Very truly yours,
EDWARD J. BROWN.
Minneapolis, Minn.

ABSTRACTS

Procksch, M. Bilateral Keratitis and Iridocyclitis with Multiform Exudative Erythema. Wien. med. Woch., 1921, p. 1076.

In the course of a multiform exudative erythema, a bilateral catarrhal conjunctivitis occurred. Two weeks after the skin eruption, a bilateral keratitis of peculiar appearance was noticed: a ring of one to more rows of small round interstitial infiltrations of the cornea. Five days later a bilateral fibrinous superficial iritis with precipitates and pigmented synechiae set in. These conditions continued for a week, then gradually grew better, and five weeks after the onset of the exanthema the eye symptoms had disappeared with the exception of slight corneal infiltrations and residues of the precipitates. Characteristic were the acute onset, the relatively serious symptoms and the benign course. H. A.

Vogt, A. and Knuesel, O. Remote Damage to Retina by Trauma of Skull. Klin. M. f. Augenh., 1921, v. 67, p. 513.

The authors report in detail, 3 cases of retinal changes, originally described by Purtscher, after a fall upon the head, in 2 unilateral, in 1 bilateral. A fracture of the skull could not be proved, and there was no loss of consciousness. The changes consisted in white foci in the anterior layers, round, from 1/4 to 1 disc size, exclusively in the papillo-macular region spattered hemorrhages. Central and peripheral visual disturbances, immediately and soon after the accidents. The white foci and hemorrhages healed in the course of months, followed by slight temporal pallor of the disc and long remaining crescentic scotomas.

The observations yielded some new points by means of more exact methods of examination, which seem to support Purtscher's explanation. The location of the white foci, protruding the limitans interna like clouds, in the layer of nerve fibers is proved by the fact that they partly cover the large vessels or partly lie immediately under them. Sometimes they are sharply cut off by a vessel, which acts as a barrier to their spreading. The white glistening crystals, as remnants of absorption, indicate that retinal substance has been destroyed within the white foci, and probably consist of cholesterin. They represent the anatomic basis of the vessel disturbances and the temporal pallor of the disc. The changes were most pronounced soon after the trauma. This is the expression of forcing of lymph between the tissues of the retina, by a sudden violent increase of intracranial pressure; while choked disc is produced by a chronic increase of pressure.

With Gullstrand's binocular ophthalmoscope, a lucid edema of the retina was ascertained. In the stage of absorption the streaky hemorrhages appeared as the nuclei of the white foci. They are also due to stasis, as further proven by the abnormal congestion of the chief veins. Hence the white foci and hemorrhages are the consequences of the same cause, viz., the increase of intracranial pressure, the hemorrhages contributing to the rupture of the lymphatic sheaths. The affection is entirely distinguished from the opacity of Berlin, which is diffuse and transient, and is caused by contusion of the eyeball, not the head. C. Z.

Feigenbaum, A. Tarsectomy in Trachoma and Trichiasis. Klin. M. f. Augenh., 1921, v. 67, p. 600.

From his experience with tarsectomy, according to Kuhnt, in many hundreds of cases in Palestine, Feigenbaum recommends it in all cases that require protection and reparation of the endangered cornea. His technic, a modification of Kuhnt's is described in detail. The dressing and sutures are left only for 24 hours. The after treatment consists in nitrat of silver for a few days and 20% solution of sulfat of copper. With this method he obtained complete cures of very severe cases of trachoma in from 1 1/2 to 3 months. The most striking was the considerable absorption of the pannus corneal opacity, and the amelioration of vision and correction of malposition of the lids, especially trichiasis. C. Z.

Schall, E. Extensive Tuberculosis of Anterior Segment of Eye and Lens. Klin. M. f. Augenh., 1921, v. 67, p. 584.

A boy, aged 10, had in the summer of 1919 an inflammation of his right eye, which 3 weeks before his admission in February 1920 ended in blindness. Ciliary injection, iris atrophic, permeated by large blood vessels, in the lower portion 3 yellowish papules, posterior synechiae, complicated cataract. Tubercular habitus, glands of neck, von Pirquet positive. Secondary glaucoma set in with yellowish exudate in anterior chamber, which increased, development of new nodules in the iris, infiltrations of the cornea. On account of irritation of the left eye, enucleation.

The anterior chamber was filled with tuberculous granulation tissue, covering the pupil, and extending to the iris and ciliary body, which was transformed into a large solitary tubercle. The granulation tissue invaded the cornea and the lens. In the adjoining retina were a few recent tubercles, the choroid intact. The cornea showed diffuse recent inflammation, an exacerbation of the chronic tuberculous process in the iris and ciliary body, but the large number of leucocytes in these indicated also here a combination of acute inflammation with the chronic. C. Z.

Behr, C. Anatomy of Senile Degeneration of Macula. Klin M. f. Augenh., 1921, v. 67, p. 551.

Behr gives the histologic description of a case of senile degeneration of the macula of a man, aged 78, who for some time complained of impairment of sight. Macroscopically a small dark spot was seen at the center of the macula, otherwise no changes. The affection consisted in exclusively degenerative processes without traces of inflammatory or reactive changes, most marked in the foveola and decreasing toward its margins. The degeneration progresses from outside, commencing at the outer membranes which disappear, to the inner membrane and the outer granules, and second from the foveola as a center toward the periphery of the macula. Essential changes of the choroid and ascending degeneration in the optic nerve were missed. At the inception, the simple primary degeneration is limited to the neuroepithelia of the foveola and fovea.

The senile degeneration of the macula, is like the congenital, infantile, juvenile, virile, and presenile forms, only an especial type of the general clinical aspect of macular heredodegeneration. The cause of the changes lies, not in external nocuous influences, but in the genetic units in the parental germ plasm. It is a hereditary premature death of the maculoretinal neuron. The anamnesis in this case did not seem to exclude the possibility

that in 3, at least in 2, successive generations a senile degeneration of the macula occurred. In order to diminish the deleterious action of the light thru filtration of the short waved rays, Behr gave two such patients euphos glasses, which exerted a beneficial influence and were enjoyed by them.

C. Z.

Clegg, J. Gray. Central Scotoma in Anterior Uveitis. Brit. J. Ophth., v. VI, No. 3, 1922, p. 118.

The author records some personal observations on the occurrence of a definite central or paracentral scotoma in cases not due to any ophthalmoscopic diseased state at the posterior pole. The scotoma may be relative or absolute, evanescent or permanent. The author's present view is that the scotoma is due to toxic influence on the retinal elements at the macula and secondarily on the papillo-macular band of nerve fibres. It is well known that certain toxic substances can produce scotoma. It is the author's opinion, that all forms of inflammation, other than directly traumatic, affecting the uveal tract are due either to bacteria or their toxins, and it would not be surprising if the same toxin were to damage the retina or the papillo-macular bundle. No doubt in a proportion of cases where the visual acuity has been considerably lowered without obvious reasons apparent in the media, a central scotoma will be found if it occurred to the observer to examine for it. Four case histories and five field charts accompany the contribution. The first case had a severe iridocyclitis in which the right eye was lost, the left eye showed a central scotoma. There was also present posterior ethmoidal and sphenoidal sinus involvement. Cases two and three were smokers, the latter was luetic, no fundal lesions. Case two showed a paracentral absolute scotoma. Case three, a central scotoma for color which later became absolute. Case four, iridocyclitis. no fundal lesion, left eye showed a large sector-shaped scotoma extending above fixation, the right showed a small central scotoma for color. D. F. H.

Fromaget, C. and H. Congenital Varicocele of Orbit. Ann. d'Ocul., 1921, v. 158, p. 116-120.

The patient presented a slight right exophthalmus, which could be partially reduced by pressure. However, by voluntary effort, she could produce an exophthalmus of 8 to 10 mm., without any deviation. This was accomplished by holding her breath and increasing the intrathoracic tension, which caused an interference with the return venous circulation. However, pressure on the internal jugular nerve produced no exophthalmus, but it occurred when the head was lowered so that the veins of the head became overfilled.

The authors consider the condition to be one of an orbital varicocele, where there was an abnormal venous network lying in the muscular cone and pressing the eye forward at all times. This was increased whenever this plexus became distended.

C. L.

Bollack, J. and Hartmann, E. Tumor of Hypophyseal Region with Lateral Homonymous Hemianopsia. Ann., d'Ocul., 1921, v. 158, p. 105-116.

Female, age 36, complaining of visual troubles 7 months, but with a history of cessation of menses and increased headaches on the right side, with exacerbations at night, which became more frequent and severe, and were accompanied by vomiting. Ocular examination showed paresis of the right oculomotor, increase in size of right pupil, right disc injected, blurred and slightly projecting. V=5/7.5. Field of vision showed a left homonymous hemianopsia, with preservation of central vision. Among other symptoms found, there was a distinct enlargement anteroposteriorly of the sella turcica, with destruction of the posterior clinoid processes. The patient died in less than 3 weeks, and the postmortem showed a large cystic tumor of the hypophysis, with more or less destruction of the right motor oculi and right optic tract. The various features of the case are discussed at length, and there are illustrations of the position of the tumor. C. L.

Bollack. Postencephalitic Paralysis of Associated Ocular Movements. Soc. de Neur., Jan. 12, 1922. Abst. Gaz. des Hôp. 1922, v. 95, p. 106.

A child of 11 years, following general transitory symptoms of an encephalitic type, has presented for four months the single symptom of a complete paralysis of elevation, divergence and convergence of the eyes, and of movement toward the left. The accommodation is unaffected, tho the contraction of the pupil is abolished on looking straight ahead. C. L.

Guillain, G. Contraction of Lids Caused by Voluntary Occlusion of Eyes. Soc. de Neur., Jan 12, 1922. Abst. Gaz. des Hôp., 1922, v. 95, p. 107.

A patient of 59 years, showed a phenomenon characterized by the fact that voluntary occlusion of the eyes caused a certain degree of rigidity or spasm of the orbiculares palpebrarum which prevented the eyes from opening for 10 to 15 seconds. Everything else was normal. There was no known etiology but in spite of the fact that the patient showed no neuropathic state, the author considered the condition a functional one. C. L.

Stähli, J. Ocular Palsy from Malignant Tumor of Nasopharynx. Klin. M. f. Augenh., v. 65, 1920, p. 888.

A woman, aged 62, otherwise healthy, presented a complete paralysis of the left abducens, which disappeared after 3 months, but relapsed 7 weeks later, on August 17, 1918. On January 2, 1919, she returned and complained that for 6 weeks she had diplopia, obstructed nose breathing with offensive discharge, and insomnia. The rhinological examination revealed an extensive inoperable carcinoma of the nasopharynx. On Feb. 14, right, slight ptosis, pupil horizontally oval, both pupils reacting sluggishly to light. V. R. 1. V. L. only perception of light. Both fundi, especially optic nerves, normal.

Second Case. A man, aged 49, showed on July 10, 1919, incomplete ptosis, paresis of the internal and superior recti, R. On July 19, the ptosis had almost completely subsided; and on July 27, all the paresis, so that the patient resumed work. After 2 weeks, again diplopia, hearing failed rapidly and also vision of the right eye. On Nov. 27, 1919, R. ptosis, pupil enlarged, reacted poorly. V. fingers at 1 mm., visual field concentrically contracted, optic disc somewhat pale, outlines indistinct. Left eye normal. The rhinologic examination revealed extensive inoperable sarcoma.

Stähli urges rhinologic examination in all cases of monosymptomatic ocular palsies. C. Z.

Maucione. Contributions to the Study of Ocular Leprosy. Arch. di Ottal. v. 28, 1921, pp. 247-260.

The author reports five cases of ocular leprosy. In most of them, both the iris and the cornea were affected by tubercular form of leprosy. The typical iritis showed the pupil occluded with exudate and many posterior synechia, often in both eyes. Sections showed numerous granulomatous nodules full of lepra bacilli, with also a few staphylococci as a secondary infection even in the deeper iris nodules. The cornea showed white plaques near the limbus, which proved to contain bacilli on section. In one case the whole choroid and ciliary body were diffusely infiltrated, the small vessels of the choroid being entirely replaced by a typical leproma showing many bacilli. The only two cases in which treatment was at all successful were cases four and five, in which after excision of the leprous nodule on the limbus, intensive treatment by sodium cacodylat was commenced at once. In both of these cases vision was retained or even increased during treatment and other general symptoms improved, during a comparatively short time of observation, however. Large doses of sodium cacodylat were given intramuscularly every two days. The author emphasizes the fact that deep lesions in these cases had existed for as much as three years before the superficial lesions developed, which argues for the endogenous route of infection as the usual one in these cases.

S. R. G.

NEWS ITEMS

Personals and items of interest should be sent to Dr. Melville Black, 424 Metropolitan Building, Denver, Colorado. They should be sent in by the 25th of the month. The following gentlemen have consented to supply the news from their respective sections: Dr. Edmond E. Blaauw, Buffalo; Dr. H. Alexander Brown, San Francisco; Dr. V. A. Chapman, Milwaukee; Dr. Robert Fagin, Memphis; Dr. M. Feingold, New Orleans; Dr. Wm. F. Hardy, St. Louis; Dr. Geo. F. Keiper, LaFayette, Indiana; Dr. Geo. H. Kress, Los Angeles; Dr. W. H. Lowell, Boston; Dr. Pacheco Luna, Guatemala City, Central America; Dr. Wm. R. Murray, Minneapolis; Dr. G. Oram Ring, Philadelphia; Dr. Chas. P. Small, Chicago; Dr. John E. Virden, New York City; Dr. John O. McReynolds, Dallas, Texas; Dr. Edward F. Parker, Charleston, S. C.; Dr. Joseph C. McCool, Portland, Oregon; Dr. Richard C. Smith, Superior, Wis.; Dr. J. W. Kimberlin, Kansas City, Mo.; Dr. G. McD. Van Poole, Honolulu; Dr. E. B. Cayce, Nashville, Tenn.; Dr. Gaylord C. Hall, Louisville, Ky.; Dr. Edward D. LeCompte, Salt Lake City.

DEATHS.

Dr. G. Martin, a prominent ophthalmologist of Bordeaux, died recently.

Dr. Clarence Warfield, Baltimore, age fifty-six, died May tenth from pulmonary tuberculosis.

Dr. Conrad W. Wilkowske, Chippewa Falls, Wisconsin, age forty-seven, was drowned June seventeenth, when the boat from which he was fishing overturned.

PERSONAL.

Dr. and Mrs. Charles H. May, of New York City, sailed for Europe July 5th.

Dr. H. Alexander Brown announces the removal of his offices to Suite 719, St. Paul Building, San Francisco.

Dr. George W. Jean of Santa Barbara, California, has just returned from a two months' trip East. He was host at the May meeting of the New York Ophthalmological Society held at Delmonico's.

Professor Fuchs, of Vienna, gave by invitation a three weeks' course of lectures on eye pathology, in San Francisco, beginning July tenth.

The Swedish Medical Association presented Professor Gullstrand with a gold medal to commemorate his sixtieth birthday.

Dr. and Mrs. Melville Black, who have been touring England and Scotland since May, returned to Denver July thirtieth.

Announcement is made of the appointment of Dr. Robert S. Lamb, Washington, D. C., as representative of ophthalmology on a committee for the continued study of local anesthetics.

The honor of knighthood was conferred, in June, upon Mr. Richard R. Cruise, surgeon-oculist to the King of England.

At a recent meeting of ophthalmologists of Germany, the Graefe prize was awarded to Behr of Kiel, Hertel of Leipzig, and Köppe of Halle.

Several doctors arrived in Honolulu with the Shriners, one of them being Doctor John A. Pratt of Minneapolis, Minnesota, who says he is enjoying every minute of his visit, and expects to pay us many more in the future when he needs a real rest.

Dr. William G. Rogers, Honolulu, has been ill with influenza for the past ten days. He expects to take a vacation and recuperate on the "big island," Hawaii, enjoying the cool breezes at an elevation of some five or six thousand feet, where an overcoat is needed every day and strawberries flourish the whole year.

MISCELLANEOUS.

The state of Kentucky has appropriated $200,000 for a new trachoma hospital at Pikeville.

The Governor of Minnesota has appointed a commission to investigate work for the blind and for prevention of blindness.

Dr. Charles B. Kobert, of Kentucky, started in June, in a fully equipped hospital wagon, for a six months' trip through the western part of the state. He will give free treatment to all persons suffering from eye diseases.

Current Literature

These are the titles of papers bearing on ophthalmology received in the past month. Later most of them will be noticed in Ophthalmic Literature. They are given in English, some modified to indicate more clearly their subjects. They are grouped under appropriate heads, and in each group arranged alphabetically, usually by the author's name in **heavy-face type.** The abbreviations mean: (Ill.) illustrated; (Pl.) plates; (Col. Pl.) colored plates. Abst. shows it is an abstract of the original article. (Bibl.) means bibliography and (Dis.) discussion published with a paper. Under repeated titles are given additional references to papers already noticed. To secure early mention, copies of papers or reprints should be sent to 217 Imperial Building, Denver, Colorado.

DIAGNOSIS.

Cantonnet, A. Testing vision of aviator. (2 ill.) Presse Méd., 1922, June 10, p. 957.

Jackson, E. Pupil and visual acuity. A. J. O., 1922, v. 5, p. 585.

Strebel. Testing vision. Schweiz. med. Woch., 1922, v. 52, p. 456.

Szekrenyi, v. Stein's tonometer. Klin. M. f. Augenh., 1922, v. 68, p. 653.

Von der Heydt, R. Technic of observation with Gullstrand slit lamp. A. J. O., 1922, v. 5, pp. 537-539.

Woods, H. Eye examinations in neurotics or psychoneurotics. A. J. O., 1922, v. 5, pp. 555-560.

THERAPEUTICS.

Beaumont, W. M. Butyn; Substitute for cocain. Brit. Jour. Ophth., 1922, v. 6, pp. 316-319.

Bolone, T. Intramuscular injections of sterilized milk. Gior. di Oculist., 1921, p. 11. Abst. Rev. Gén. d'Opht., 1922, v. 36, p. 148.

Elschnig. Protein therapy in eye disease. Med. Klin., 1922, v. 1, p. 758.

Lanier, L. H. Present status of vaccine therapy in eye disease, with special reference to autogenous vaccines. (bibl.) Arch. of Ophth., 1922, v. 51, pp. 349-359.

Rollenberg Sampaio, J. M. Thyroid therapy in ocular affections. 1922, S. Paulo, Brazil.

Tobias, G. Focal reaction in eye in protein therapy. Klin. Woch., 1922, p. 515.

PHYSIOLOGIC OPTICS.

Brouwer, B. Visual projection in man. (ill.) Netherlands Cent. Inst. for Cerebral Investigation, Amsterdam. Abst. A. J. O., 1922, v. 5, p. 592.

Diaz-Caneja. Experiments of Wheatstone. (7 ill.) Arch. de Oft. Hisp.-Amer., 1922, v. 22, pp. 297-316.

REFRACTION.

Argañaraz, R. Asthenopia and ocular fatigue. Semana Med., 1922, v. 29, p. 994.

Dowling, J. C. Extraction of clear lens for high progressive myopia. Jour. Ophth. Otol. and Laryng., July, 1922, pp. 249-254.

Duane, A. Binocular accommodation. Arch. of Ophth., 1922, v. 51, p. 396.

Jeandelize, P. Infectious maladies causing paralysis of accommodation. Rev. Méd. de l'Est., 1922, p. 82. Abst. Rev. Gén. d'Opht., 1922, v. 36, p. 180.

Keyms, J. Axis of astigmatism and its location. Brit. Med. Jour., 1922, May 27, p. 838.

Lewis, W. W. Homatropin cycloplegia. A. J. O., 1922, v. 5, pp. 540-542.

McMillan, L. Failure of accommodation with sore throat. Lancet, 1922, May 27, p. 1048.

Szekrenyi, v. Refractometer of von Berth and Neumann in Jena. Klin. M. f. Augenh., 1922, v. 68, p. 653.

OCULAR MOVEMENTS.

Banister, J. M. Strabismus sursumvergens comitant. A. J. O., 1922, v. 5, p. 564.

Blaskovics, L. v. Subcapsular tenotomy. Abst. Klin. M. f. Augenh., 1922, v. 68, p. 651.

Burch, F. E. Tendon tucker and method of suturing. (2 ill.) Arch. of Ophth., 1922, v. 51, pp. 360-364.

Cantonnet, A. Double paralysis of right externals in tabes. Arch. d'Opht., 1922, v. 39, pp. 345-348.

Fellows, C. G. Strabismus cases. Jour. Ophth. Otol. and Laryng., 1922, July, p. 261.

Goldberg, H. G. Complications associated with Todd tucking operation. (dis.) A. J. O., 1922, v. 5, pp. 552-554.

Koellner. Significance of nystagmus in localization of lesions of medulla oblongata. Klin. Woch., 1922, v. 1, pp. 1137-1142.

Marin Amat, M. Recurring paralysis of ocular muscles with hemicrania. (bibl.) Arch. de Oft. Hisp.-Amer., 1922, v. 22, pp. 316-332.

Vandegrift, G. W., and Losey, R. R. Paralysis of convergence and paresis of accommodation. Arch. of Ophth., 1922, v. 51, p. 405.

White, J. W. Paralysis of associated movements downward. (dis.) Arch. of Ophth., 1922, v. 51, p. 399.

Young, G. Subconjunctival advancement. (1 ill.) Brit. Jour. Ophth., 1922, v. 6, p. 323.

Repeated titles. **Bettremieux.** (O. L., 1921, v. 17, p. 260.) Brit. Jour. Ophth., 1922, v. 6, p. 331. **Pinard and Bethoux.** (A. J. O., 1922, v. 5, p. 597.) Rev. Gén. d'Opht., 1922, v. 36, p. 180.

CONJUNCTIVA.

Allisson, F. H. Heterobacteriotherapy for gonococcic conjunctivitis in adult. (bibl.) Rev. Gén. d'Opht., 1922, v. 36, pp. 101-109.

Fernando, A. S. Blindness among Filipinos. (bibl.) Arch. of Ophth., 1922, v. 51, pp. 374-378.

Gemblath, S. Subconjunctival injections of mercury cyanid for trachoma. A. J. O., 1922, v. 5, p. 568.

Heckel, E. B. Gonorrheal conjunctivitis. (dis.) A. J. O., 1922, v. 5, p. 562.

Heed, C. R. Pseudopterygium and symblepharon corrected by Teale's operation. A. J. O., 1922, v. 5, p. 550.

Hoffman, J. N. Common eye conditions. Indian Med. Jour., 1922, v. 25, p. 166.

Jervey, J. W. Folliculosis or trachoma among school children. Kentucky Med. Jour., 1922, v. 20, p. 496.

Li, T. M. Trachoma in China. Natl. Med. Jour., China, 1922, v. 8, pp. 1-11. Abst. J. A. M. A., 1922, v. 79, p. 162.

Mori, S. Primary changes in eyes of rats from deficiency of fat-soluble A in diet. (7 ill.) J. A. M. A., 1922, v. 79, pp. 197-200.

Nicolas, F. Tuberculosis of conjunctiva. Arch. of Ophth., 1922, v. 51, pp. 379-383.

Patton, J. M. Wrestlers' trachoma. A. J. O., 1922, v. 5, pp. 545-546.

Roetth. Unilateral trachoma. Klin. M. f. Augenh., 1922, v. 68, p. 653.

Whitham, L. B. Ocular pemphigus. (bibl.) Arch. of Ophth., 1922, v. 51, pp. 389-395.

Repeated title. **Smoira.** (A. J. O., 1922, v. 17, p. 545.) A. J. O., 1922, v. 5, p. 590.

CORNEA AND SCLERA.

Akitani, H. Bilateral scleritis with corneal degeneration. Chuwo Gank. Iho., 1920, v. 14, No. 2.

Brown, W. H. Syphilitic infection of eye in rabbits. (dis.) Arch. of Ophth., 1922, v. 51, p. 408.

Imre, v. Jr. Megalophthalmos. Abst. Klin. M. f. Augenh., 1922, v. 68, p. 652.

Masuda. Successful treatment of phagedenic ulcer of cornea. Kenyokwai Zasshi, 1921, Oct. Abst. Japan Med. World, 1922, v. 2, p. 109.

Patton, J. M. Corneal abscess. (dis.) A. J. O., 1922, v. 5, p. 567.

Watkins, E. D. Superficial punctate keratitis. A. J. O., 1922, v. 5, pp. 546-548.

Repeated title. **Mazzei, A.** (A. J. O., 1922, v. 5, p. 164.) Brit. Jour. Ophth., 1922, v. 6, p. 330. **Rossi, V.** (O. L., 1921, v. 17, p. 547.) A. J. O., 1922, v. 5, p. 590.

ANTERIOR CHAMBER AND PUPIL.

Alexander, W. Loss of pupil reflex in epilepsy. Med. Klin., 1922, v. 18, p. 831.

Repeated title. **Behr, C.** (A. J. O., 1922, 5, p. 164.) A. J. O., 1922, v. 5, p. 591.

UVEAL TRACT.

Darier, A. Specific and paraspecific treatment of infectious iridocyclitis. Clin. Opht., 1922, v. 26, pp. 303-306.

Key, B. W. Atrophy of uvea. (dis.) Arch. of Ophth., 1922, v. 51, p. 407.

Krauss, F. Atrophy of iris. A. J. O., 1922, v. 5, p. 550.

Kretzschmer, S. Chronic iridochoroiditis. Lausanne thesis, 1921. Abst. Rev. Gén. d'Opht., 1922, v. 36, p. 175.

Mitchell, L. J. C. Action of atropin and eserin on iris. Med. Jour. of Australia, June 17, 1922, pp. 664-668.

Peter, L. C. Sclerosis of choroid. A. J. O., 1922, v. 5, p. 550.

Sherman, E. S. Idiopathic cyst of iris. (dis.) Arch. of Ophth., 1922, v. 51, p. 398.

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Repeated title. **Baldino, S.** (O. L., 1921, v. 17, p. 548.) A. J. O., 1922, v. 5, p. 591.

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Gifford, H. Glaucoma, peripheral iridectomy. (dis.) A. J. O., 1922, v. 5, p. 565.

Hiroishi, H. Juvenile glaucoma and myopia. Japan Med. World, 1922, v. 2, p. 74.

Potter, G. B. Glaucoma simplex. (dis.) A. J. O., 1922, v. 5, p. 566.

Stahlman, F. C. Glaucoma. (dis.) A. J. O., 1922, v. 5, p. 561.

Ziegler, S. L. Sarcoma, glaucoma and complicated cataract. A. J. O., 1922, v. 5, p. 551.

THE CRYSTALLINE LENS.

Green, A. S., and L. D. Intracapsular expression extraction of cataract. (2 pl. 3 fig.) Arch. of Ophth., 1922, v. 51, pp. 338-348.

THE RETINA.

Bell, G. H. Retinitis proliferans from anemia produced by Hodgkin's disease. (1 pl.) A. J. O., 1922, v. 5, pp. 531-532.

Davis, A. E. Recurrent retinal hemorrhages. Arch. of Ophth., 1922, v. 51, p. 396.

Coats' disease. (dis.) Arch. of Ophth., 1922, v. 51, p. 397.

Gonzalez, J. de J. Hemeralopia with hepatic disease. Rev. Vallis. de Espec. Men. Med., 1922, v. 8, p. 104.

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Graef, C. Eye conditions in pregnancy. Canadian Med. Assn., 1922, v. 12, pp. 481-484.

Heckel, E. B. Complicated detachment of retina. A. J. O., 1922, v. 5, p. 563. Occlusion of central retinal artery. (dis.) A. J. O., 1922, v. 5, p. 563.

Horvath. Hemorrhagic retinitis after salvarsan. Klin. M. f. Augenh., 1922, v. 68, p. 652.

Jackson, E. Retinal lipemia. A. J. O., 1922, v. 5, p. 584.

Lange, H., and Simon, M. Effect of light on phosphoric acid in retina. Hoppe-Seyler's Zeit. f. physiol. Chemie, June, 1922, pp. 1-30.

Stahlman, F. C. Retinitis pigmentosa or lues. (dis.) A. J. O., 1922, v. 5, p. 562.

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Licsko. Optic atrophy with dystrophia genitalis. Abst. Klin. M. f. Augenh., 1922, v. 68, p. 651.

Liebermann, L. v. Optic neuritis cured by milk injections. Soc. Hongroise d'Opht., 1921. Abst. Clin. Opht., 1922, v. 26, p. 311.

Nicolas, F. Bilateral atrophy of optic nerve associated with meningeal disease. Jour. Philippine Islands Med. Assn., 1922, v. 2, pp. 70-72.

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Peter, L. C. Leber's disease in four generations. A. J. O., 1922, v. 5, p. 551.

Repeated title. **Cheval, V.,** and **Coppez, H.** (O. L., 1921, v. 17, p. 553.) A. J. O., 1922, v. 5, p. 589. **Fromaget.** (A. J. O., 1922, v. 5, p. 518.) Rev. Gén. d'Opht., 1922, v. 36, p. 186.

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Weidler, W. B. Tumor of pituitary body. Arch. of Ophth., 1922, v. 51, p. 404.

Repeated titles. **Gourfein-Welt** and **Redaille.** (A. J. O., 1922, p. 166.) Med. Jour., Australia, 1922, June 17, p. 676. **Hirsch, O.** (O. L., 1921, v. 17, p. 417.) A. J. O., 1922, v. 5, p. 589. **Lenz, G.** (A. J. O., 1922, v. 5, p. 250.) A. J. O., 1922, v. 5, p. 593.

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Dimitry, T. J. Evisceroneurotomy with endothesis as substitute for enucleation. (7 ill. bibl.) Arch. of Ophth., 1922, v. 51, pp. 365-373.

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Clapp, C. A. Entropion following influenza, with new surgical procedure. (3 ill.) A. J. O., 1922, v. 5, pp. 542-544.

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Wheeler, J. M. Pulsating exophthalmos. (dis.) Arch. of Ophth., 1922, v. 51, p. 401.

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Franklin, W. S., and Cordes, F. C. Intraocular foreign body of 46 years' duration. (bibl.) A. J. O., 1922, v. 5, pp. 533-537.

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